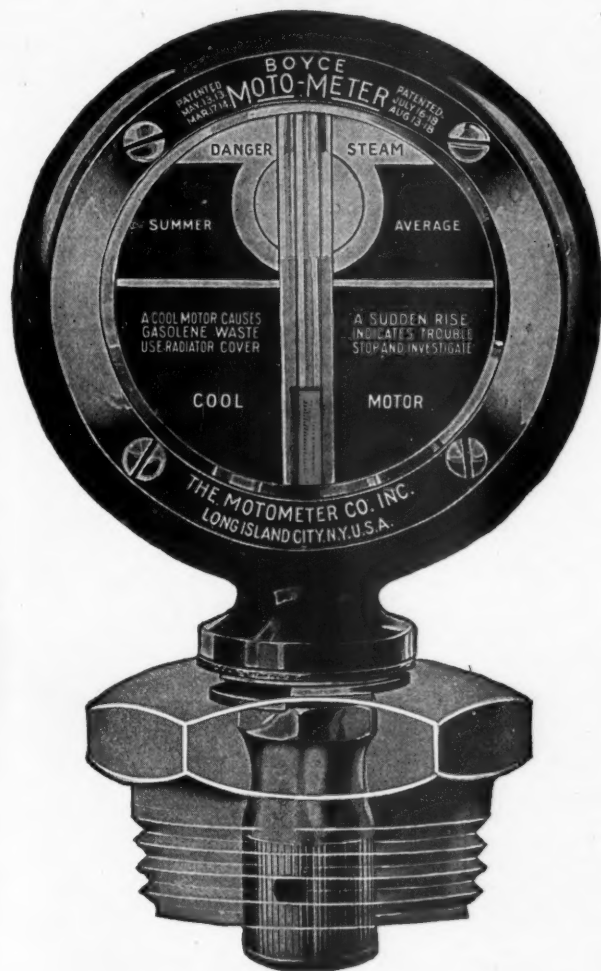


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Number 24

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MALLERS BUILDING
CHICAGOPhone Randolph 6960
Cable Address "Motage"

E. E. HAIGHT, Manager

DAVID BEECROFT, Directing Editor

RAY W. SHERMAN, Executive Editor B. M. IKERT, Editor

BRANCH OFFICES

DETROIT, 317 Fort St., W., Phone Maine 1351; CLEVELAND, 536-540 Guardian Bldg., Main 6432; NEW YORK CITY, U. P. C. Bldg., 239 W. 39th St., Phone Bryant 8760; PHILADELPHIA, Widener Bldg., Phone Locust 5189; BOSTON, 185 Devonshire St. Phone 4336 Ft. Hill.

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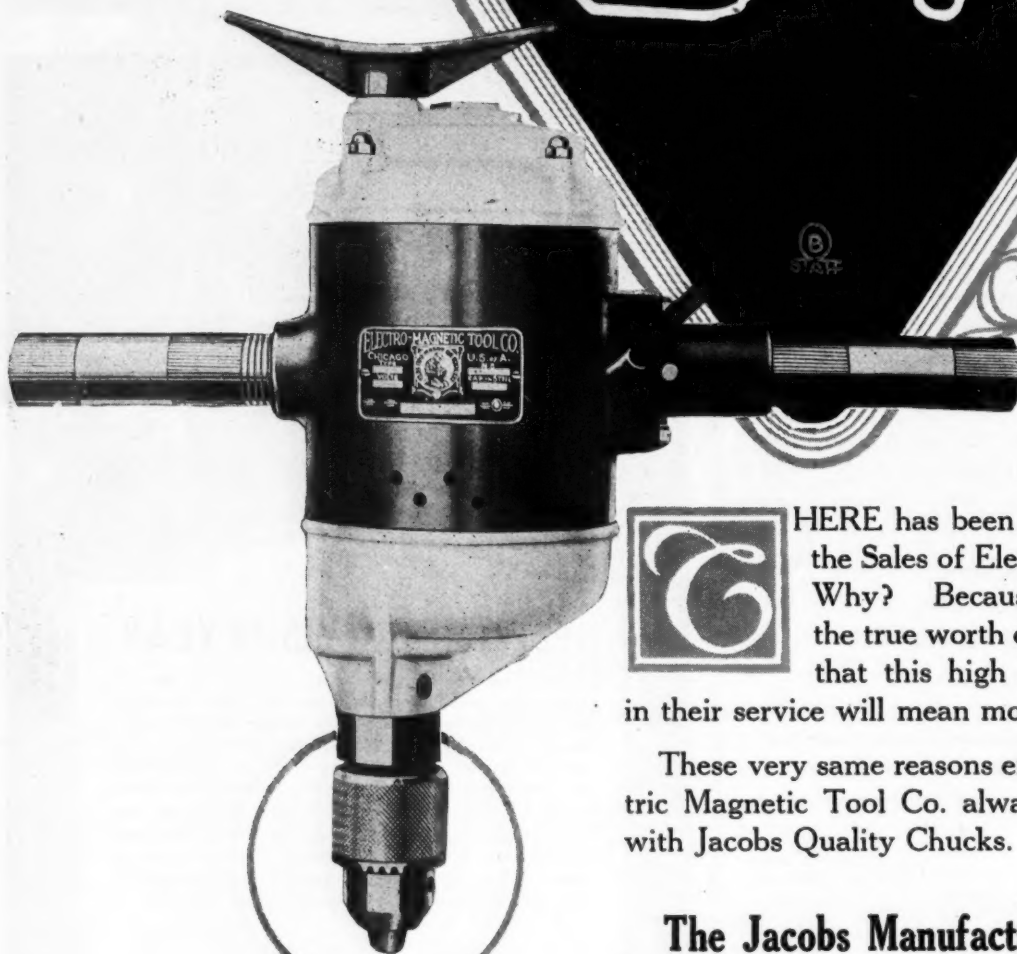
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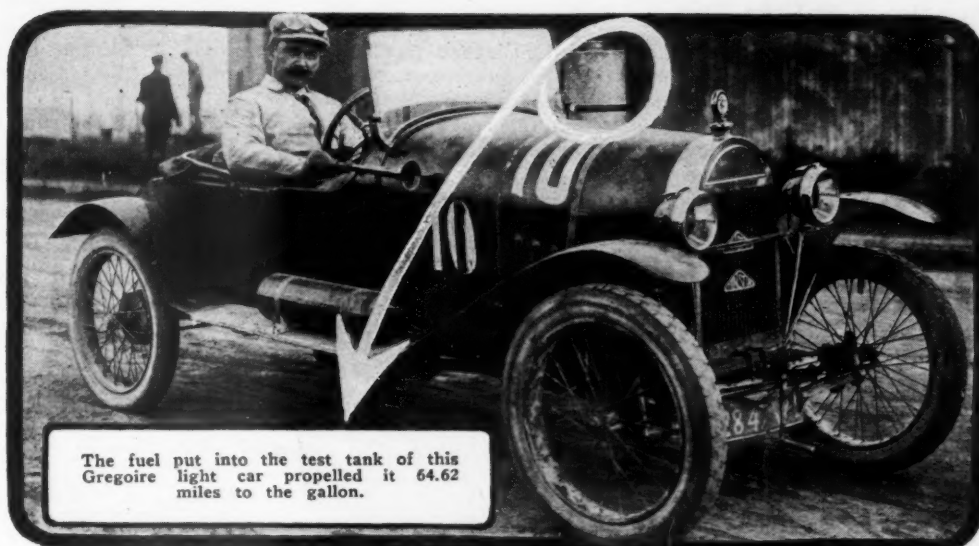
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MOTOR AGE

Getting the Utmost from Our Fuel Stock Car Contests Would Stimulate Engine Development



The fuel put into the test tank of this Gregoire light car propelled it 64.62 miles to the gallon.

WHILE the results obtained in the recent Indianapolis race as regards the performance of the 183 cu. in. engines, together with those of the French fuel consumption Grand Prix at Le Mans are not within the reach of the average car owner, they are valuable in shaping our future plans in which economies can be made.

It is significant when a four-cylinder sedan with four passengers will travel 70 miles to the gallon of fuel. It is significant, too, that most of the competitors in the French competition used benzol in preference to the gasoline and those who did prefer the latter, chose heavy grade rather than light fuel.

In a contest of any kind wherein automotive vehicles are involved there always are points of interest that can be made use of in various ways by those who are called upon to design and build such vehicles. Engineers get many valuable lessons from the speed performances of the cars in an event like the Indianapolis race.

It means something, for example, when it is possible to send a car fitted with a 183 cu. in. engine around the Hoosier oval for 500 miles in less time than it took a 300 cu. in. car to do the same distance.

Of course, no car owner can duplicate this performance with a stock machine, but it simply goes to show what is possible with a small engine.

Similarly the performances of the cars in the French fuel contest cannot be easily duplicated by the average owner, because cars must be prepared for such contests. The value of such contests lies in the fact that it shows our modern cars, potentially, at least, can do some remarkable things when it comes to getting the last ounce of energy from the fuel.

We might, for example, give the subject of crankcase aspiration more thought. This was one of the features of the French trials, and while no data is available to show just what the results were, engineers who experimented along these lines claim the oil consumption was not excessive. It is stated that oil was not actually drawn from the crankcase, but use was made of the oily vapor suspended in it.

Much can be done to get better fuel mileage by fitting engines with hot-spot devices, electric heating of the carburetor, special camshafts, lighter reciprocating parts, change in timing, etc. It is certain our engineers will come through with some good developments in the future whereby it will be possible for the average car owner to approximate, at least, some of the results of the French trials.

There has been some agitation in this country about fuel economy contests and many have it that such a series of events would be productive of excellent results. It would, for one thing, awaken the car owner to the fact that he probably is not getting all the fuel efficiency from his car possible and certainly it would spur on the car makers, carburetor engineers and fuel experts to new fields of development.

How They Finished in the Recent French Fuel Contest

Class	Car	Miles Per Gallon
61 cu. in.	Gregoire	64.62
85 cu. in.	Citroen	62.03
122 cu. in.	De Bion Bouton.....	49.09
183 cu. in.	Ford	38.81
274 cu. in.	Voisin	36.59

FRENCH CARS SHOW EXCELLENT RESULTS IN FUEL CONTEST

Record Set by Gregoire Light Car in Recent Fuel Consumption Grand Prix at Le Mans—Figures for Heavier Cars Also Raised

PARIS, May 24.—Nearly 65 miles on one gallon of benzol was the record set by a two-seater Gregoire light car with a four-cylinder engine of 2.4 by 3.5 ins. bore and stroke, in the French fuel consumption Grand Prix at Le Mans.

This was not the only record broken, for right along the line, from the small two-seaters of 61 cu. in. piston displacement to the full sized seven-passenger touring cars of 270 cu. in. displacement, extraordinary figures were shown, and old records were broken.

Each of the forty competitors was given a certain amount of fuel determined according to piston displacement, seating capacity, weight and type of body, and all were sent away on a carefully guarded course $4\frac{1}{2}$ miles around, over which they had to run until the fuel supply was exhausted. The winner could be considered either as the one traveling the greatest distance, or the one showing the highest mileage per gallon.

The results were different, according to which method of classification was employed. Thus, Citroen No. 1 went the greatest distance before stopping with an empty tank, but its mileage per gallon was less than that of the Gregoire. The Ford got first in its class considered on miles per gallon, but dropped down to seventh place on the basis of actual distance covered.

In the big car class, too, the open sleeve-valve Voisin No. 2 was beaten by its teammate No. 1 with a seven-passenger Voisin sedan, on the basis of total miles run, for it put up a record of 79.39 compared with 76.84 miles.

PREFER BENZOL

Competitors could select their own fuel, and in nearly all cases preferred benzol to gasoline. Mixtures of gasoline and benzol were not used, and the few who did use gasoline preferred heavy grade to light fuel. The Gregoire car which showed the highest mileage per gallon was equipped with a Lacharnay carburetor. Solax furnished the carburetor for the winners in the 85.43, the 122.5 and the 183 cu. in. classes, while the Voisins in the 274.12 cu. in. category had Zenith carburetors modified according to the ideas of the Voisin engineers.

By W. F. BRADLEY

European Correspondent of MOTOR AGE.

The competition called forth the best work of French engineers and carburetor experts, and although the results obtained are not within the reach of the average automobile owner, they are valuable as an indication of directions in which economies can be made, and they are significant by reason of the improvement over the trials of a year ago.

Only stock cars were admitted, but changes could be made when they had in view increased fuel efficiency. For in-

stance, special camshafts and pistons could be used, the timing could be changed, compression increased, ignition and carburetor could be special, there could be electric heating for the carburetor and oil, if desired. It was forbidden, however, to change the type of engine, and if the standard product was an L-head engine it was forbidden to use an overhead-valve type.

Speed was not sacrificed to fuel economy, except in a case of a very small number. The big cars ran at 30 to 35 m. p. h., and in the afternoon of the same day, without any adjustments in the meantime, many of them put up

Standing of Cars in French Fuel Competition

	CARS	Distance Covered, Miles	Fuel Allowed, Am. Gall.	Miles per Gallon	Carburetor
(61.1275 CUBIC INCHES)					
1	Mathis.....	93.57	1.53 B.	61.15	Solox
2	Mathis.....	92.39	1.61 B.	57.38	Solox
3	Majola.....	76.79	1.55 B.	49.54	Claudal
4	Grégoire.....	72.39	1.12 B.	64.62	Lacharnay
(85.435 CUBIC INCHES)					
1	Citroën.....	94.91	1.53 B.	62.03	Solox
2	Citroën.....	92.48	1.56 B.	59.28	Solox
3	Mathis.....	90.08	1.53 B.	58.86	Solox
4	Mathis.....	87.96	1.55 B.	56.74	Solox
5	Citroën.....	86.47	1.56 B.	55.43	Solox
6	Citroën.....	76.64	1.37 B.	55.94	Solox
7	Citroën.....	67.25	1.55 B.	43.38	Eureka
8	Citroën.....	59.87	1.49 B.	40.11	Solox
9	Citroën.....	51.68	1.48 Gas.	34.91	Solox
(122.5 CUBIC INCHES)					
1	De Dion Bouton.....	78.55	1.60 B.	49.09	Solox
2	Chenard & Walcker.....	76.98	1.79 B.	43.00	Solox
3	Chenard & Walcker.....	67.56	1.78 B.	37.95	Solox
4	Corre La Licorne.....	65.07	1.51 B.	43.08	Solox
5	De Dion Bouton.....	63.09	1.58 B.	39.93	Solox
6	Suère.....	53.08	1.64 Gas.	32.36	Solox
7	Alva.....	52.46	1.53 B.	34.28	Mob.
(183.075 CUBIC INCHES)					
1	Delahaye.....	71.75	1.96 B.	36.60	Solox
2	Talbot-Darracq.....	69.79	2.23 B.	31.29	Cozette
3	Delahaye.....	65.51	1.87 Gas.	35.03	Solox
4	La Buire.....	64.23	1.96 B.	32.77	Lacharnay
5	Grégoire.....	64.17	1.82 B.	35.25	Lacharnay
6	Delahaye.....	63.91	1.96 B.	32.60	Cozette
7	Ford.....	58.74	1.51 Gas.	38.81	Solox
8	Ford.....	55.67	1.51 B.	36.86	Solox
9	Colombe.....	53.75	1.67 B.	32.18	.....
10	Ford.....	45.49	.....	.....	.....
11	Ford.....	35.95	1.45 Gas.	24.78	.....
12	Ford.....	34.96	1.55 Gas.	22.55	.....
13	Ford.....	34.89	1.61 Gas.	21.67	.....
14	Ford.....	27.70	1.56 B.	17.30	.....
15	Ford.....	15.92	1.57 B.	10.14	.....
(274.12 CUBIC INCHES)					
1	Voisin.....	79.39	2.75 B.	28.86	Zenith
2	Voisin.....	76.84	2.10 B.	36.59	Zenith
3	Delahaye.....	67.79	2.39 B.	28.36	Cozette
4	Bignan.....	67.40	2.46 B.	27.39	Claudal
5	Mors.....	59.80	2.05 B.	29.19	Solox

speeds of 60 m. p. h. for a distance of about 65 miles.

USED CRANKCASE INDUCTION

One of the features of the competition was the tendency to make use of crankcase induction. This was allowed under the rules, and interesting work was done by the Zenith engineers and by Cozette, a French carbureter expert. On a four-cylinder De Dion Bouton sedan, with four passengers, it was possible to get 70 miles to the gallon with a Zenith carbureter and crankcase induction.

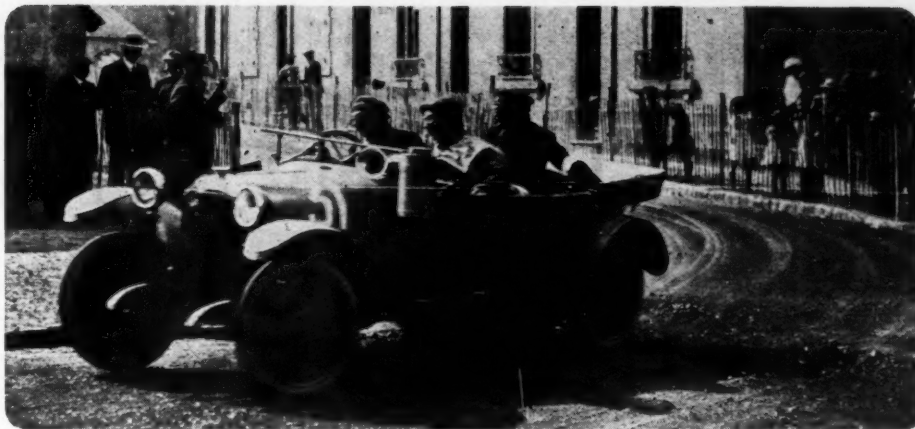
It is claimed that oil was not actually drawn from the base chamber, but the oily vapor suspended in the chamber was made use of. On a 20 hp. Darracq sedan, with four cylinders of 33 by 51 ins. bore and stroke, Cozette got a consumption of 36 miles to the American gallon. In this case small quantities of oil were drawn from the base chamber, and after being vaporized in the exhaust manifold were passed into the intake manifold. No data is available to show exactly how much oil was consumed with this arrangement, but the engineers claim that the increase was not excessive.

In certain cases, as for instance, with engines having leaky crankcases, the normal oil consumption is hardly increased at all, for aspiration from the base chamber eliminates most of the leaks.

PROTEST CRANKCASE ASPIRATION

On the night before the competition the Solex Carbureter Co. protested against crank case aspiration. Charles Faroux, the technical member of the contest, who had authorized this, withdrew, and allowed the remainder to vote, when a decision was given against allowing any air to be drawn from the crankcase. Zenith replied by withdrawing, thus pulling out of the competition a large number of De Dion Bouton cars and all the Peugeot machines.

Cozette decided to remain in, but was put at a great disadvantage by having to modify everything during the night before the trials. A lot of jealous protests were lodged, one being put against the Peugeots because they were not full



The DeDion Bouton four-passenger which ran 49.09 miles to the gallon in the French fuel competition

width according to the rules. When the cars had been altered, they were protested because they were not stock models.

Arrangements to insure accuracy and



The Voisin sedan which covered 28.86 miles on a gallon

prevent cheating were admirable. The use of the standard tank was not allowed, but instead a special tank had to be mounted either on the outside of the body, or inside when sedan bodies were used, so that it was always under the

view of the observer, and had no hidden pipes. The course was divided into hundred yard sections, with official observers on each, as well as regular troops.

After the tanks had been filled the cars were kept under military guard for the night and were pushed out to the starting line, where they were cranked by hand, for electric starters had to be either entirely dismantled or put out of commission. An observer connected with a rival firm was placed aboard each car and kept count of distance covered. As the course was marked off by posts at 100 yards intervals, it was an easy matter to calculate the distance.

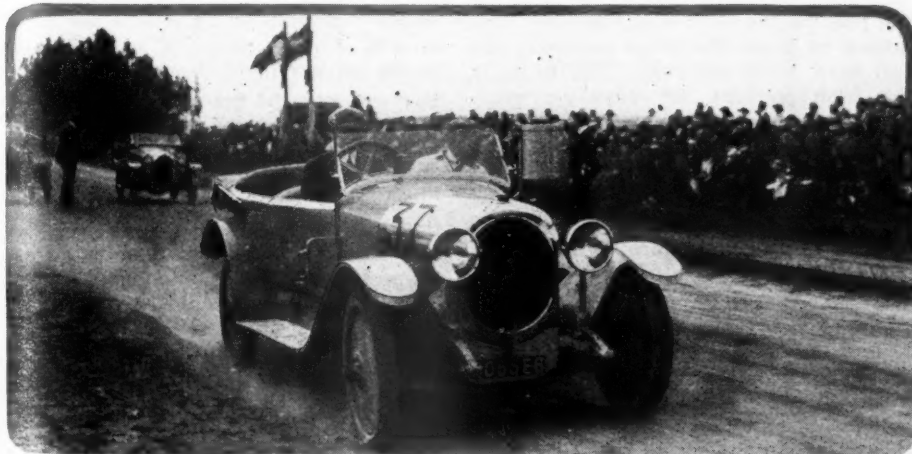
High compressions were common, and in some cases oil consumption was high. The Voisin sedan with a sleeve-valve engine headed the list in this respect with a consumption of 1½ gal. of lubricating oil to cover 79 miles, while the fuel consumption for the same distance was only 2¾ gal. The companion open Voisin consumed slightly more than ½ gal. One-fifth of a gallon was used by the Bignan-Sport sedan to cover 67 miles. All the others used extremely small quantities of lubricating oil.

MILWAUKEE PLANTS ACTIVE

Milwaukee, June 13—The effect of the recent price reductions announced by numerous passenger car builders has been to excite distributors and dealers to greater activity for orders for immediate and future delivery. Operations of factories therefore are steadily being increased and good recovery is being made from the production decline. It is expected that schedules will be back at the May level by the end of June and after July 1 it will be possible to reach the highest output of the year so far.

The situation of the motor truck industry is growing better steadily and some plants in Milwaukee and Wisconsin which have been running on low schedules, or have been idle for some time, are resuming production on a scale to meet the demands.

Repairmen complain that collections are slow. Demands for repair and replacement or maintenance service are very heavy, both on passenger and commercial cars.



This car, a Chenard-Walcker, went 43 miles before its gallon of fuel was exhausted

Analysis of Farming Cost Shows Economy of Tractor

*Plowing by Horse Higher Per Acre Than by Tractor—
Disking and Grain Cutting Costs by Tractor and Horse
Quite Close*

By DAVID BEECROFT

MANY misleading bits of information on what a tractor can do on the farm and how it compares in capacity for work and cost of work are partly corrected in a preliminary report on an investigation of tractor and horse work on 286 farms in Ohio, Indiana and Illinois, conducted by the Bureau of Farm Management and Economics of the Department of Agriculture, the investigation being made by a series of investigators who visited these 286 farms in the latter part of 1920.

The Department of Agriculture was assisted in the work by a horse association known as the Bureau of Animal Industry, and as such was sponsored by a horse organization rather than by tractor manufacturers. Having originated under what might be designated as horse auspices, it can scarcely be considered as favorable to tractor farming, yet the result is generally highly complimentary to the tractor.

During the year 1920 covered by the investigation on the 286 farms on which horses and tractors were used the report shows that the cost of farming by tractor was no greater than the cost by horses. This really means a cheaper cost for tractors, for as the preliminary report of the Department of Agriculture says "any saving in man labor costs, any gain due to getting a larger amount of work done in a given time, and any other advantage connected with the use of tractors, which cannot be measured directly in dollars and cents might be considered clear profit."

It has always been considered that a paramount advantage derived from the use of the tractor in farming is the conservation of the man power due to the short time in which a tractor will accomplish a given unit of work as compared with the time needed by horses.

Still another tractor advantage of importance has been the ability to do the farm work in the time that it best can be done by the tractor and the greater crop yield due to this, as compared with the longer time needed by the horse. Big tractor farmers have always advanced this as the strongest reason for tractor use. This has appealed to them

A Report of Tractor Operating Costs

THE report of the Bureau of Farm Management and Economics of the Department of Agriculture shows that on 286 farms in Ohio, Indiana and Illinois, the tractor does the work of 2.1 horses on an average throughout the year. The repair costs per year on the two-plow tractor was \$39 and was the same on the three-plow machine, the report shows.

The two- and three-plow machines were out of commission only two days per year on the average when needed. Annual depreciation of the two-plow machine is put at \$164 and on the three-plow machine, \$217. The tractors were not all new ones. Several have been in use over three years.

more than the cost-saving per acre in the work by tractors as compared with that done with horses.

The government report shows that on the 286 farms using tractors the tractor does the work of 2.1 horses on an average throughout the year. On these farms the tractors averaged only 30.8 full days' work per year; but the old tradition that the horse works 300 days in the year on the farm was exploded. The horses on these 286 farms averaged 68.6 full days' work per year. The horse is far from working 300 days per year. There is not work for him all the time and if there were he could not stand it the year round.

The report shows that in 1920 the cost of plowing by horse was higher per acre than by tractor. Here are the figures:

Plowing Cost Per Acre	
2-plow tractor.....	\$2.20
3-plow tractor.....	2.20
Horses	2.90

Here the report adds that in 1921 with reduced cost of horse feed the cost per acre of plowing by horses would be \$1.90, adding that the cost of farming by horses has reduced much more in the past year than the cost of farming by

tractor. The report makes an effort to show what reduction in cost has been made by tractors due to reduced tractor prices and lower fuel prices.

In such other farm operations as disking and grain cutting the costs by tractor and horse are remarkably close. Here they are:

Cost Per Acre	
Disking by tractor.....	\$0.67
Disking by horse.....	.64
Grain cutting, tractor.....	.67
Grain cutting, horses.....	.59

Some light on the cost of keeping horses per year is shed by the report which states that on the 286 farms the average cost of keeping a horse per year is \$159. This cost includes charge for feed, shoeing, veterinary, housing, interest at 6 per cent on investment and depreciation. It also gives the horse a credit of \$15 per year for manure. The feed for the horse averaged \$135 per year alone. Again the report apparently endeavoring to favor the horse estimates that based on March, 1921, prices the cost of feed per horse for 1 year would be about \$80, but no deduction as to reduced tractor cost has been made. The average farm cost for horse labor per year on the 286 farms was \$1,076. The cost of a horse per day is \$2.43 for each day it works based on 68.6 days' work per year.

Some side lights on the long mooted question as to whether a farmer can sell some of his horses when he purchases a tractor are given in the report from the 286 farms. On 172 of the farms there was a reduction of 2.2 horses per farm. A still further analysis of these 172 farms reveals the following:

Farmers who did not reduce horses.....	44
Farmers who reduced by 1 or 2 horses.....	62
Farmers who reduced by 3 or 4 horses.....	43
Farmers who reduced over 4 horses.....	23

This is a definite answer to the question and the fact that a horse averages only 68.6 days' work per year on the 286 farms leads to the conviction that quite a few more horses could be disposed of if the farmer analyzed the situation as carefully as he might. Before these 286 farmers purchased tractors they had one horse to every 27.6 acres and after they had tractors they averaged one horse to every 37.9 acres. That there is a very great surplus of work horses on the average farm is plain by the fact that on 143 of the 286 farms all of the horses

were not used for any one operation on the farm—there was always a reserve of horses.

Some useful cost figures on tractor operation are covered in the report. The 286 farmers estimated the life of the tractor at 6.7 years. To operate a two-plow tractor per day costs \$12.65, and a three-plow tractor \$17.75.

In fuel consumption, while the kind of fuel used is not given in the report, quantities are, and for different farm work the fuel consumption per day is:

	Gallons
Plowing 2-plow tractors.....	18
Plowing 3-plow tractors.....	23
Hay-loading 2-plow tractors.....	11
Hay-loading 3-plow tractors.....	15
Fuel per acre for plowing 2-plow tractor.....	2.8
Fuel per acre for plowing 3-plow tractor.....	2.7

The capacity of these tractors per day for different works are as follows:

Plowing 2-plow tractor.....	6.6 acres
Plowing 3-plow tractor.....	8.6 acres

The measure of work done by the tractors on the 286 farms covered in the report varied according to the kind of work, naturally the hardest job, plowing, being largely done by tractor. The following percentages are averages for all farms:

Plowing (by tractor).....	85%
Disking (by tractor).....	73%
Harrowing, etc.....	43%
Grain cutting.....	41%

Haying15%

The volume of tractor sales in a given territory is highly dependent on the acreage of farms in the territory, and the type of tractor is also influenced by this fact. Naturally more two-plow types were found on the 286 farms than three-plow types and four and five-plow jobs were very very rare. Here are the figures:

No. 2-plow tractors.....	174 farms
No. 3-plow tractors.....	104 farms
No. 1-plow tractors.....	1 farm
No. 4-plow tractors.....	6 farms
No. 5-plow tractors.....	1 farm

Total farms.....286 farms

The 286 farms averaged 258 acres, which is larger than the average size of farms in these three states and the two-plow tractor was used on 75 per cent of farms under 160 acres and on 53 per cent of farms 160 acres or over.

The tractors were not all new ones, several having been used over three years and others as shown by the following tabulation:

1 year or over.....	106 tractors
1½ or 2 years.....	100 tractors
2½ or 3 years.....	49 tractors
Over 3 years.....	31 tractors

286 tractors

With these figures in mind the repair cost per year may be considered. The repair cost per year on the two-plow tractor was \$39 and was the same on

the three-plow tractor. The two-plow and three-plow tractors were out of commission only two days per year on the average when they were needed. Annual depreciation of the two-plow tractor is put at \$164 and on the three-plow tractor \$217.

It is questionable if tractors on these farms are used as much as they might be. There is always considerable belt work for tractors but the report shows them used very little for such. The big job is what is called drawbar work, that is, pulling some implement such as plow, disk, self-binder, hay-loader, etc. Here is an analysis showing averages on the 286 farms:

Drawbar work.....	23.5 days
Belt work.....	2.7 days
Custom work.....	4.6 days

Total.....30.8 days

The report contains a few very useful observations on the possibility of farmers reducing cost of doing work by horses and also by tractors. It says: "Repair costs and fuel consumption of the tractors could in many cases have been reduced. The fact that on 20 of the 286 farms the work horses did less than 40 days' work per head per year indicates that on some farms there are still more work stock than needed."

HAVE YOU THOUGHT OF AN OPEN HOUSE?

NOT so very long ago the United Automobile Service, Laundry Lane, Lowestoft, England, threw open its works for a week in order that the public might become a little better acquainted with its organization. It is a plan, which, in part, might be followed by some of the service stations in this country.

Some dealers and service men are of the opinion that the public should not be admitted into the shop and strictly draw the line on this point. Others maintain that excellent results are to be had if the customers are permitted in the shop so that they can see their cars worked upon and incidentally note the efficient layout of machinery and shop equipment. Certain it is that some of our shops would not be favorably commented upon, if the public were turned loose in them for inspection, with others it might be different.

Probably the best plan to follow if one decides to have the public make an inspection of the service station is to set aside a few days or a week, like this English concern did, and this week should come at a time when the shop is not too busy. In some shops where it is customary to allow visitors the workmen and machines are partitioned off by wire netting, so that there is little or no interference with the work and yet plenty of opportunity for the visitors to see everything.

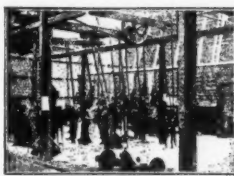
Bakeries and similar institutions frequently put their machinery in a position where it is visible to all, and the effect is that people buy from them because they see exactly how the bread is baked or the cookies are browned.

Let the Owner Know Your Service Facilities



PORTION OF GARAGE.

UNITED
Automobile Services
Sales & Service Dept.
LAUNDRY LANE,
LOWESTOFT



A CORNER OF THE MACHINE SHOP

Dear Sir,

It is just possible you are unaware that we do all classes of Repairs for private owners to Motor Cars and Commercial Vehicles, and to let you see for yourself the facilities we have for doing this class of work we purpose having our entire works open for inspection for one week commencing on March 14th, from 2.30 to 4.30 p.m. each day.

Visitors will be shown through the various departments, viz., Garage, Machine Shop, Overhaul Work-shop, Service Dept., Spare Stores Dept., Coach Factory and Main Offices, (where Tea, etc., will be provided) by the Service Superintendent and Sales Manager and the various labour Saving Machine tools explained; consisting of five latest improved Lathes, Sensitive Power Drilling Machines, Arbour Presses, Carborundum Grinders, Plug Testing Apparatus, Electric charging of Accumulators, 160 tons Pressure Tyre Press, Planing and Mortice Machines, Circular and Band saws, etc., etc. Overhead Gallantry for removing cylinders and heavy parts to and from different parts of the workshops.

We extend to you a cordial invitation to see these and work in progress.

Card enclosed herewith,

Yours faithfully,

E. J. Mead
Service Superintendent

The letter which invited customers and others to the service stations.

THE FIXED PRICE SYSTEM TO WELD GOOD WILL

One Concern Has Put Into Use a Comparative Cost Sheet by Which It Is Able to Determine If the Flat Rate Costs Should Be Lowered or Eventually Raised

TO avoid dissatisfaction it is necessary to have an understanding with the customer in advance, as to the cost of repairs. There are, in general, three ways of accomplishing this, as follows:

- 1—An approximate estimate
- 2—A maximum estimate
- 3—A fixed price basis

The Thornton-Fuller Automobile Co., Philadelphia, is employing the last-mentioned method with profit to both customers and company, although the chief profit to the company is good will, friendliness and confidence inspired thereby.

The fixed price, or flat rate basis as it is also known, enables the service department to supply to the customer not an estimate, but a flat quotation, so that the customer knows in advance of the work what it will cost him; what work is to be charged for and what work, if any, in the nature of policy, or service guarantee work, will be done without charge. The company has on record the customer's signature as an order for the work.

The customer feels reassured, as he has a signed statement of what is to be done on his car and what it will cost him. There is a minimum of failures to have the work completed when promised, as the exact amount of work done on all the cars in the shop is recorded from hour to hour on blackboards at the service department gate and in the requisition department. Should a customer call, a clerk can inform him by glancing at the blackboard in just what process of completion his car may be at that time, if it is finished and ready for him, or just when it will be ready.

The amount of time consumed in the shop on the various operations is known to the management from day to day and idle time, corrective labor and excess time on any kind of job are reduced to a minimum. In other words, the system enables the service station to perform the work more expertly, more reasonably and quicker than the ordinary garage or service station.

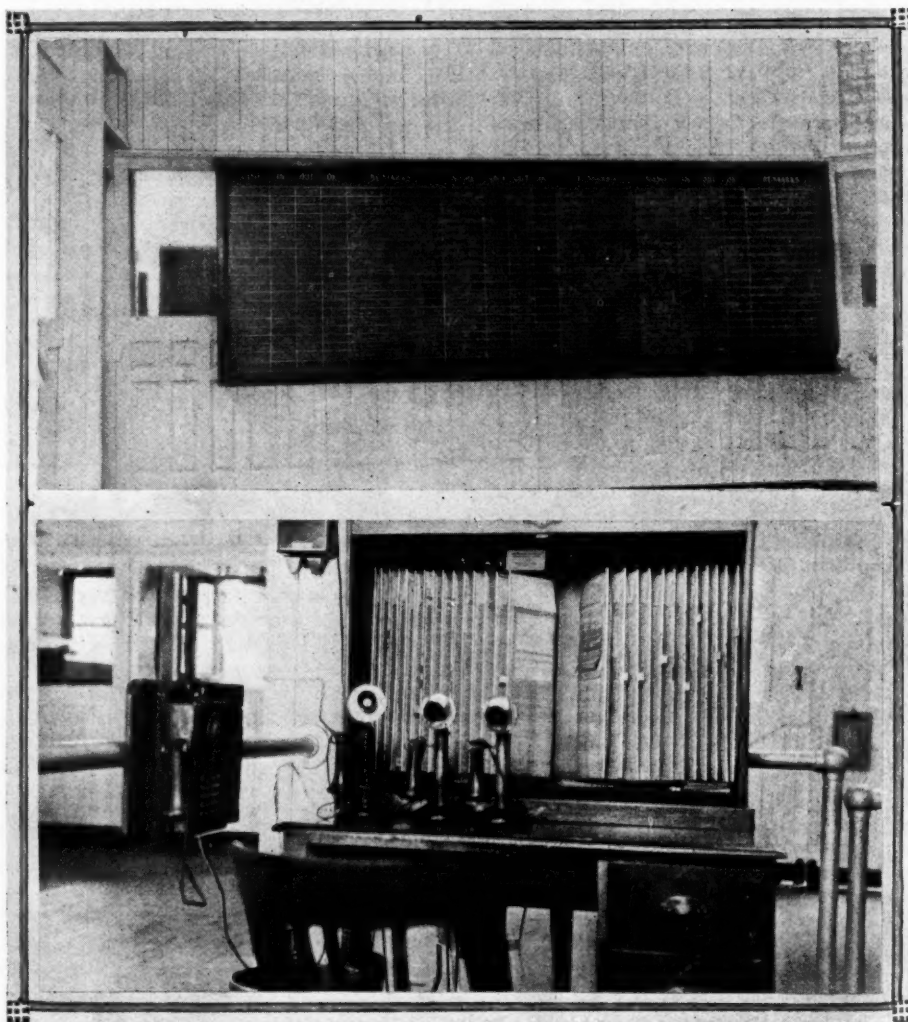
To obviate delayed deliveries from the repair shop, as soon as the job has been finished, a post card is mailed to the customer, informing him that his car is out of the shop and ready for him and

asking his co-operation in having it removed at the earliest possible date.

Every job is figured at cost and labor rates to check against the estimated price for the flat rate, so there may be no danger of overcharge to the customer.

This enables the company to keep the fixed charges at a minimum. Some days the sheet may show a "loss" on the total of jobs in comparing the flat with the hourly rate; but, of course, there is always some actual profit, as the estimated

Systematizing Fixed Price Service



The visible file in the cabinet with shutter door contains index cards whereon are grouped the different repair and adjustment operations, with the cost of each on the hourly basis from the average of which the flat, or fixed, price is derived. As fast as costs are revised the clerk, who receives the information by telephone from the technical, or service manager, or his aide, makes the necessary changes on the cards. The progress of every customer's car is recorded on this blackboard, as the vehicle is passed through the various shop operations. As soon as it leaves one operation, a clerk is informed by telephone. He then "scores" the car's location and condition. Any customer inquiring about his car is told at once by the clerk the location of his car

How You Can Check Your Fixed Price System

Job #	Insp	Job Est	Job Runs	Job #	Insp	Job Est	Job Runs
33797	G. McC	33.00	44.74	33619	E. T.	65.80	75.81
33696	J. C.	28.60	34.13	33891	T. T.	4.05	4.02
33908	H. G.	28.50	31.84	33898	T. T.	6.35	6.32
33899		4.65	4.65	33854	W. B. W.	9.50	8.17
33888	G. McC	14.50	13.82	33623	T. T.	90.70	93.25
33877	G. McC	3.75	2.72	33880	E. G.	59.25	59.55
33840	W. B. W.	6.50	18.39	33895	H. E.	3.00	3.00
33779	F. B. S.	27.55	24.88	33760	H. B. S.	18.00	19.03
33809	H. B. S.	4.00	3.64	33866	W. B. W.	4.00	4.72
31748	W. B.	737.00	719.46	33642	E. G.	173.25	157.79
33875	H. B. S.	1.50	1.25	33701	J. C.	38.40	38.40
33829	R. F. Z.	20.00	12.79	33865	G. McC	4.25	4.06
33828	H. B. S.	13.35	18.64	33789	W. B. W.	15.35	14.15
33570	J. C.	38.80	41.30	33818	E. G.	3.00	3.00
33747	E. G.	33.00	22.55	33812	H. B. S.	11.75	8.72
33827	W. B. W.	1.50	2.14	33820	G. McC	26.25	28.86
33843	W. B. W.	5.25	3.38	Total: - 2,030.32		2,080.21	
33737	E. G.	9.00	7.38	Service Guarantee Jobs.			
32123	T. T.	101.00	5.63	33911	E. G.	3.13	
33794	W. B. W.	31.50	42.28				
33508	W. B. W.	314.00	337.87				
33582	E. G.	45.77	74.68				
33801	H. B. S.	14.50	13.26				
33823	G. McC	12.95	6.54				
33860	G. McC	3.00	3.15				
33810	E. G.	19.00	26.64				
33825	H. B. S.	17.50	17.40				
33846	E. G.	19.25	19.23				

flat rate is made out at a low margin of profit. Should the "loss" on a job be found to be too great continuously, when compared with the fixed rate, the latter is revised upward after a watchful period of a month or more; but whenever it is found that a job can be performed for less than the figure for the flat rate, the latter is revised downward at once, to give the customer the benefit.

A checking clerk has the special duty of making out a daily comparative sheet of these costs—the job, "as it runs," with labor and material, and the fixed rate, submitting it to the service superintendent, who, in turn, gives it to the service manager. The comparative cost sheet is always typed, and signed by the clerk. In columns, in this order, it presents the job number, the initials of the inspector of that job, the job as estimated at the flat rate and on the hourly basis. At the bottom of the sheet is a record of costs of the service guarantee work, or "chargeless jobs," for that day.

It is by reviewing this comparative cost sheet that the service manager, or technical manager as he is called here,

is able to determine whether the flat rate should be lowered at once, or eventually raised.

Because there are so many "overlapping" charges in a fixed price system—the removal or adjustment of one part, for instance, often involving the adjustment of another part—it was early decided that it would be undesirable to operate with a "Master Sheet," or group number-and-symbol method indicating stated sets of repair jobs, excellent though this has been found in connection with an approximate, or a maximum estimate basis.

A CARD FOR EVERY OPERATION IN VISIBLE FILE

Instead, every operation is grouped on cards in a visible index filing system enclosed in a cabinet. This cabinet is placed on the desk of a special duty clerk whose duty it is to record the almost daily revisions made in certain operations which, it is found, can be reduced in cost for the customer's benefit.

If, for instance, the repair is to be a brake adjustment, the clerk for guidance

looks under the heading Brake at the top of the card in his index file. A system of telephones connects this desk with the various departments supplying information.

At one end of the service station reception room, where customers enter to inquire about their cars, is a long blackboard, previously mentioned, near the service gate. This board, in sight of the clerk who revises the cards in the visible file, is used to record the progress of each car, by job number, customer's name and license number as it is passed through the shop from one department to another. This information is kept up to the moment.

Thus, a customer just arriving and inquiring about his car which was to be done that day, can be told by the clerk just what work is being done on it; or whether it is in the tester's hands, or whether it is "O. K." and all ready for him. The clerk has merely to look at the board, or to call up the shop, the customer's name and job number supplying the clue. A cross, or x signifies that the car is in the tester's hands.

Slams "I Don't Know" Plea In Toledo Association Meet

Toledo, Ohio, June 9.—Addressing a meeting held by the Toledo Automotive Trade Association in the Chamber of Commerce recently, P. E. Chamberlain declared that the lack of a sense of responsibility of his job on the part of the individual employee often defeats the purpose for which a business is organized.

"We make an investment in our business for just one purpose—to serve the public in our chosen line of endeavor. We say, in effect: 'Please come in Mr. and Mrs. Meal-Ticket and spend your money here. We have no other excuse for business existence except to serve you. We understand our obligations as a merchant and our invitation to you to patronize us carries with it the implied statement that we have the understanding and efficiency in our organization to carry out our obligations to you to the fullest extent.'

"And then when this meal-ticket comes to the door, often we cannot answer his most fundamental questions. He is greeted with, 'I don't know; I am not sure; I cannot tell you exactly what it will cost'—in short, he is greeted by an individual who hasn't studied his job. Thus is the very purpose of the investment defeated.

"We cannot afford to pay a \$25,000 a year man to write his own letters. By the same token, we cannot afford to pay shop superintendents to 'shag' parts, write orders and things of that kind. The executives in this business are about due to start to work on their own jobs—of being executives. Of teaching the men who have to sell their propositions to the public, just what the propositions are."

Chamberlain addressed the dealers of Bay City, Saginaw and Flint and the members of their organization at a joint meeting in Bay City, Mich. recently.

KEEPING RECORD OF A TWO-MILLION DOLLAR BUSINESS

How the Rude Auto Co. Has Simplified Its Accounting System So That It Easily Can Tell the Status of the Home Office and Four Branches in Other Towns

THE information we want, when we want it, yet involving no useless overhead expense in keeping up unnecessary records," was the statement made by one of the officials of the Rude Auto Co., Marshalltown, Iowa, in regard to its accounting system.

This sounds remarkably simple until we learn that the Rude company handles the Ford line at four branches in Iowa, Cedar Rapids, Perry, Nevada, and Belle Plaine; that the gross sales amount to more than \$2,000,000 yearly and that all accounting is done at the home office in Marshalltown.

Systems must always be cut and fitted to the particular business and to the particular way of doing business. Realizing this, the accounting department devolved an accounting system that is particularly adapted to the needs of the Rude company. Here is the general plan of action:

Each salesman is furnished with a supply of salesman's daily report blanks which he fills out as he makes his calls each day. This form has spaces for the name and address of the prospect, source from which his name was obtained, type of car or tractor he is interested in, whether there seems to be a chance of closing with him, date of next appointment, his financial condition, if it can be obtained, and the reason for not closing the sale at the time of making the call. At the bottom of the report is space for report on weather and roads and the salesman's name. By means of these reports, the sales manager of the branch is enabled to check up on the progress made by each of his salesmen, day by day.

Each night, these reports are handed in and the information transferred to the customer's information cards kept by the sales manager of each branch. These form an office record both before and after the customer is sold and furnish any information necessary to the sales manager. Each branch keeps and files both the salesman's daily reports and the customer's information cards; all information necessary to the home office is forwarded in the branch manager's daily report.

Accessory sales slips are made out in triplicate; one is given to the customer, one retained by the branch and one forwarded to the home office. These are marked respectively, customer's copy,

Simple Accounting

WHEN the Rude Auto Co., Marshalltown, Iowa, put in its system of accounting, it realized that such a system to be of any value must be particularly suited to the needs of the organization. The company maintains four branches in other cities, but the accounting for all is done from the home office. Every morning the home office receives a report from the branches and there is no time when the home office cannot tell the status of any of the branches.

In addition each branch is furnished a report of the business transacted by the other branches. A set of graphs kept at the parent organization shows each month's business. A master graph is made up from the graphs of all branches and as the business of the last three years has been plotted on the same sheet, it affords an interesting study as to the sales of various items in different seasons. Eight people do the accounting for the entire organization.

branch office copy and general office copy. At the home office it is possible to identify the slips belonging to each branch; the name of the branch has a border about it. Aside from this, the sales slips of the different branches are exactly the same.

The only service department record

that concerns itself in the accounting is the repair order. There are four copies of this, the fourth being a combination of repair order card, claim check and repair order record and is printed on light cardboard. The back of the repair order card is a time card for the employee who does the repair work. The other three copies are disposed of in the same way as the sales slips. The back of these are given over to records of material used on the job.

Each evening the branch manager fills out his daily report from the sales slips, the repair orders and the salesman's reports turned in. This report gives a comprehensive and detailed statement of the day's business and incorporates all information necessary to the accountants at the home office. Together with copies of sales slips and repairs orders, the report is mailed to the office at Marshalltown, arriving there the next morning.

The accounting department at Marshalltown check up the report from the sales slips and enter the information in the books. One set of books is used, but is departmentized for the different branches enabling the officials to know exactly what each branch is doing. The accounts are distributed on the books according to salesmen and articles.

This again enables the company to find and reward their best salesmen and informs the purchasing agent which type of car is selling best at a certain branch or what their requirements will be in any group of accessories. For the infor-

CUSTOMER'S INFORMATION CARD			
NAME			DATE
ADDRESS	TOWNSHIP	SECTION	
BUSINESS	CARS OWNED	IN MARKET FOR TRADE	CREDIT
REPAIR WORK DONE BY		ACCESSORIES ON CAR	
TIRES ON CAR	CONDITION	BUYS TIRES FROM	
BUYS GASOLINE		OIL CHANGED EVERY	
DATE CALLED ON	SALESMAN	SOLD	FEELING TOWARDS COMPANY

The sales manager of each branch keeps cards like this. They form an office record before and after a customer is sold and furnish any information necessary to the sales manager

mation obtained, a weekly sales report is made up for each branch. A copy of the report is sent to the branch and any notations necessary made on the back. This was started as a daily report but it was found unnecessary to sum up the sales oftener than once a week.

A summary of the revenues and expenses of each branch is made up monthly by the home office. One side of the sheet gives the expense distribution divided under the heads of administrative, labor, service, stock room, shop, office and general. There are five columns for each account headed respectively, this month, department totals, last month, this month last year and total this year. These columns provide convenient means of comparison with previous expenses of a like period. The reverse side of the sheet is given over to revenues. For each group of articles, the sale, the cost and the revenue derived is shown. Comparison may be made as on the expense side of the sheet, columns being

provided for this month, last month, this month last year and total this year.

A consolidated balance sheet is taken off monthly. Assets and liabilities of each are listed separately on the sheet and consolidated in the last column. It is, in fact, a balance sheet for each branch and also a balance sheet for the company. The back of the sheet is for statistics, such as an inventory of the articles on hand. This is filled out for the particular branch to which the copy goes. In this way, each branch is informed as to the business transacted by the other branches and furnished with an inventory once a month.

A summary of sales sheet and a sheet from the purchase register is shown. These differ but little from the conventional form, except that they are particularly adapted to the needs of the Rude company. It is interesting to note that one man does all purchasing for all branches. With records such as he has at his disposal, it is comparatively sim-

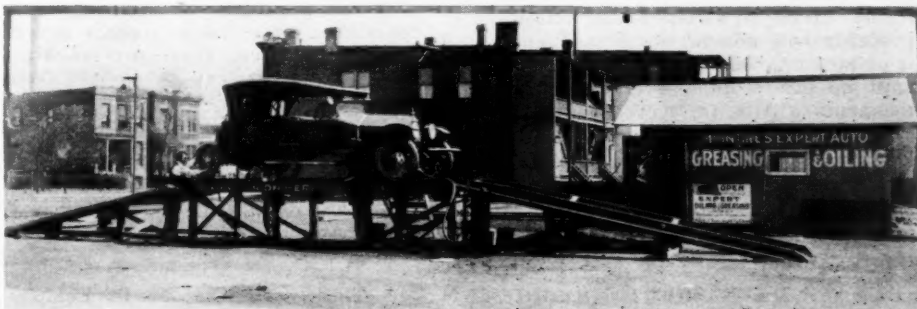
ple to anticipate the needs of the branches.

The accounting department also keeps up a set of graphs, showing the sales month by month in each branch. These are divided as to tires and tubes, gasoline and oil, etc. A master graph is made up from the graphs of the branches and as the sales for the last three years have been plotted on the same sheet, they afford an interesting study as to the sales of different things in different seasons. It is also interesting to find that the volume of each year's business exceeds that of any previous year. It is the Rude policy to "Beat our own record."

Perhaps the comparative simplicity of the Rude accounting system will be better realized when it is known that all of the work is done by eight people and the total floor space occupied by the office and records is only 20 feet wide by 40 feet long.

TWO THINGS PICKED UP IN THE FIELD OF SERVICE

RIGHT, the greasing and oiling station G. P. McIntyre, Chicago. The slogan on the runway states "Cars run on here run longer." A flat charge of \$4 is made for oiling and greasing the average car, including the cup grease. The price for Fords is \$2. When the customer desires, the crankcase, transmission and differential are drained and refilled with fresh lubricant. The runway makes it possible for



Fitting Light Weight Alloy Pistons

MUCH has been said and written in the last few years regarding the fitting of light weight alloy pistons in the cylinders of automobile engines. Experiments by manufacturers of engines

and pistons have disclosed some interesting facts along this line and there is much of this information that can be applied directly or indirectly by the automotive repair man who is called upon, at various times, to fit aluminum pistons in the customer's engine. Before he can do this successfully he must know the

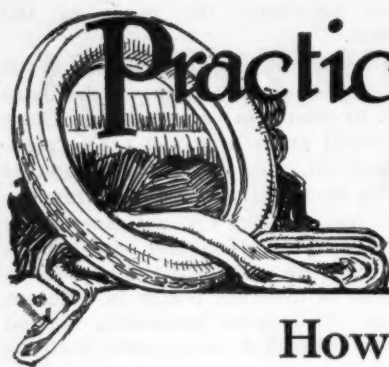
the men to reach all parts of the car with minimum effort. For filling the grease cups, high pressure guns are used.

ONE service station in Chicago, located a few blocks away from the sales building, has seen fit to partition off part of its service station and therein display the current model of the car on which it is rendering service. The idea is this: The customer may have several minutes to wait for his car and instead of loitering in the service room, he is directed to the display room and there, undisturbed by any salesman, he may look over the car at his leisure. The result has been that many owners of old models have traded in for the later one. It's a silent salesman idea worth while.

whys and wherefores of cylinder and piston work and especially of alloy pistons. Some recent investigations at the factory of the Butler Mfg. Co., Indianapolis, Ind., which concern manufactures both aluminum alloy and gray iron pistons, disclosed the following facts:

The truing up of a cylinder requires very accurate work and knowledge of the

(Concluded on page 48)



Practical Tire Merchandising and Repairing

by Stanley P. McMin



How to Advertise a Tire Business

*Humans Have Short Memories
How to Use Contracts
"Request" Certain Positions
Movie Slides Good*

*Hand-bills Bring Results
Road Signs Attract Transients
Bill-boards Attract Attention
"Cash In" on National Advertising*

"Link Up" Your Store

ADVERTISING paves the way for the salesman. It is the signboard of industry. To be successful, to bring results, it must be consistent and continuous.

One large newspaper advertisement probably will not be worth the paper it is printed on. The same amount of space split up into a number of small advertisements will be far more profitable.

What has been said with regard to keeping eternally at it applies with regard to advertising just as much as it does with regard to the salesman. It is important to keep your message always before the public.

HUMANS HAVE SHORT MEMORIES

Humans have short memories. They do not remember from week to week that John Jones is in the tire business. They do not think of John Jones. When they have a repair job they probably put it in the back of the garage until they actually need the tube or casing, as the case may be, and then are likely to give it to the first repairman whose name comes to mind.

The object should be to have your name come first to mind. Nothing will do this with a greater degree of certainty than small advertisements in the daily newspaper—advertisements that the car owner sees every morning at his breakfast table.

Advertising naturally falls into a number of divisions as follows:

- (1) Local Newspaper Advertising.
- (2) Magazine Advertising.
- (3) Program Advertising.
- (4) Movie Theater Slides.
- (5) Bill-boards.
- (6) Hand Bills or "Dodgers."
- (7) Road Signs.

Local newspaper advertising to be effective must be continuous. Never overlook this important fact. The most satisfactory way of buying newspaper space is to enter into a contract with your local newspaper to use a certain amount of space in a given time, say one year.

HOW TO USE CONTRACTS

Such contracts are based on a sliding scale, the dealer paying so much per

For Every Dealer

NO reader of MOTOR AGE who now operates or contemplates operating a tire business either as a separate business or as part of his service organization can afford to miss any part of this series.

The subjects explained are:

- 5—Advertising
- 6—Window Displays
- 7—Salesroom and Office
- 8—Service Station Facilities
- 9—The Service Station
- 10—The Service Car and Its Equipment
- 11—The Repair Department
- 12—Equipping a Shop
- 13—Tube Repairing
- 14—Fabric Tire Repair

inch of space according to the total number of inches provided for in the contract. The greater the space taken, the lower the rate per inch. Single advertisements inserted now and then take the highest rate.

In buying space on a contract, it is important to so plan the appearance of advertisements that all the space in the contract will be used up by the time the contract expires. If this is not done and if some space still remains to be used at the expiration of the year, the newspaper is likely to cancel the contract and charge a higher rate based on the amount of space used.

The advertising department of a local newspaper will always be glad to cooperate with the dealer in arranging his space requirements. But do not allow the newspaper to become too optimistic and to saddle you with a contract out of proportion to your financial ability.

"REQUEST" CERTAIN POSITIONS

It is well when signing a contract to have a definite understanding as to just where in the paper your advertisement is to appear regularly. There is a distinct advantage in having the advertise-

ment always in the same location. People become accustomed to seeing it and look for it.

On the other hand, if you definitely specify that the advertisement must appear in a certain location the paper is likely to charge extra for this. This is what is called "preferred position." However, the same result can be obtained generally by "requesting" that a certain position be used, without definitely specifying that it must be used.

Experience has indicated that for the local tire dealer to advertise in local magazines, theater programs and other publications of similar ilk is very likely to be an example of misplaced charity. In short, such advertising is of very questionable value. The circulation of such publications is limited and they are only momentarily interesting to the reader and then are discarded. Unless advertising in these publications has particular merit it would be better to shun such mediums of publicity.

MOVIE SLIDES ARE GOOD

Slides used in movie theaters are always good and may be obtained without cost from the tire manufacturer. Such advertisements appear before a selected audience when that audience is in a frame of mind to receive and to remember the dealer's message. The message on the screen gets the undivided attention of the reader.

It generally will be possible to arrange for the display of such an advertisement with your local theater manager for \$4 or \$5 a week or perhaps less. It is well to have a definite understanding with the theater manager regarding the number of times per day or week the advertisement is to appear on the screen.

HAND-BILLS BRING RESULTS

Make it a point to see the advertisement yourself and determine whether it is allowed to remain on the screen for a sufficient length of time for the average individual to read it. Too often such advertisements are flashed on and flashed off again so quickly that they cannot be read and hence their value is lost.

A great many dealers have found that

hand-bills or "dodgers" distributed directly into automobiles are perhaps the best form of local advertising. When a car owner picks up such a hand-bill his undivided attention is centered upon it. His eyes are not distracted or attracted by other advertisements on one side of it or by "pure reading matter" on the other.

One plan adopted by a dealer that may be of value is as follows: This dealer arranged with his local newspaper to run an advertisement in a Sunday edition approximately 10 inches deep and two columns wide. At the same time arrangements were made for the newspaper office to supply the dealer with a "mat" of the advertisement from which an electrotpe could be made and the advertisement reprinted at minimum cost.

In this way the dealer saved the cost of having a printer set up the advertisement and his only cost was for having the printing done. Very often local newspapers are glad to do this kind of service for their customers.

The cost of having 3,000 "dodgers" run off from an electrotpe such as described should be in the neighborhood of \$8 or \$9 though the price will vary slightly in different localities.

ROAD SIGNS ATTRACT TRANSIENTS

Road signs are always an effective means of bringing the business of the dealer to the attention of prospective purchasers. In some cases such signs are furnished by the big tire companies. They should be posted on the highways and should preferably be not more than one-half a mile apart.

Such signs are particularly good in attracting transient trade. It is a simple matter for the dealer to put them

up himself. It is wise, however, to find out, first, whether there is any state law or local ordinance which prohibits the use of this kind of advertising. This can be ascertained by telephoning the authorities.

BILL-BOARDS ATTRACT ATTENTION

Bill-boards are very valuable means of mass publicity, of bringing a particular kind of merchandise frequently and continuously before the greatest possible number of potential purchasers. Practically every one of the large tire companies maintains a considerable number of such boards. In most cases these are distributed freely and widely along the highways and frequently a considerable number are located directly in the cities.

Such signs, of course, invariably are paid for entirely by the tire manufacturer. In some cases the dealer can arrange with the tire maker to have what is called "slip sheet" pasted on the sign-board giving his own name and address.

In some cases the tire manufacturer arranges for the painting and erection of the sign with a bill-board company and contracts with the tire dealer to pay part of the cost of the sign. This generally takes the form of a monthly rental. For a sign 50 by 20 ft. the rental would be about \$20 to \$30 a month, depending upon the location and other variables peculiar to the city in which the dealer does business.

"CASH IN" ON NATIONAL ADVERTISING

All of the big companies spend hundreds of thousands of dollars in national advertising. You see pages and double pages in the big weeklys and plenty of big advertisements in daily newspapers.

The dealer who does not take advantage of this national advertising is overlooking a good bet and there are many ways in which a dealer can "cash in" on it. The simplest of these is to tear the pages out of a magazine containing the advertisement and paste them in your window. This links up the dealer with the company and with the national advertising campaign.

Another plan applicable only where the manufacturer's advertisement appears in a local newspaper is for the dealer to schedule a small advertisement beside the big one. All the advertising done by manufacturers is on a fairly rigid schedule and the dealer can easily find out just when an advertisement is to appear by writing to the factory. This will allow him to schedule his advertisements to appear at the same time or, if they are already appearing, to change the copy to link up with the manufacturers' copy.

"LINK UP" YOUR STORE

One good plan which, however, is a little more expensive, is for the dealer to get out a form letter to all of his customers and prospects calling attention to the fact that one of the advertisements of a big maker, perhaps concerning a new product, is to appear in such and such a magazine on a certain date.

Another good plan that has brought results is to have the local newspaper run off a number of copies of an advertisement and send these, along with a special letter, to the mailing list.

Pictures were the earliest means of conveying an idea. Messages were transmitted with the aid of pictures long before there was any writing. Witness the Egyptian hieroglyphics.

Therefore use pictures in your advertising at every possible opportunity. Even a very small picture is better than no picture at all. It attracts the eye much more certainly than does mere type display.

Tire manufacturers are always glad to furnish electrotypes in almost unlimited quantities. It should be a simple matter for the dealer to obtain a sufficient number of different pictures in this way to allow him to place something new before his readers almost every time the advertisement appears.

NEXT WEEK

Window Displays Will Be the Subject of Mr. McMinn's Article Next Week. Proper Use of Window Space Is a Most Effective Means of Adding to the Profits of the Tire Dealer Without Undue Expense.

ORDERS SALE OF WHEEL COMPANY

Indianapolis, June 10—Authority was given recently by the St. Joseph Superior Court for the sale of the Johnson Motor Wheel Co., of South Bend, Ind. Following financial difficulties the company was placed in the hands of a receiver. The company conducted a stock selling campaign a short time ago and hundreds of persons in the northern part of the state invested their savings in the concern.

Getting Your Story Across With Pictures

Pictures were the earliest means of conveying an idea. Therefore use pictures in newspaper advertising



WE will sell you the automobile supplies that will make your car owning experience worth while. We will supply you with extra tires to take the worry off your mind and slip covers to keep the grime off your clothes.

PHONE B-937

NEW YORK AUTO SUPPLY CO.

TIRES

ACCESSORIES GAS OILS

NORTH COR. MADISON AVE.



EDITORIAL



The Price Situation

FOR several weeks prices have been declining. There will be other declines, some scheduled for about July 1. Every dealer is asking what the effect is going to be and whether there is going to be any business during the remainder of 1921. There will be some business, of course, but perhaps a few side lights on the situation may be interesting.

In the first place, the reduction in prices has been of great benefit to the automotive industry. It has been disturbing and has upset sales, it is true; but it had to come, the industry will be better for it, and it is clearing the way for future business. The hope of the industry and trade is that this clearing of the atmosphere may come as speedily as possible.

There are those who assert that the entire disturbance might have been avoided had the manufacturers made all their price reductions at show time. It is charged that the cuts might just as well have been made at that time. This may be true, but it is difficult to make any such assertion with an assurance that it is all fact. In the first place, manufacturers six months ago were carrying high-priced inventories and it takes perhaps more courage than the average man has to write off millions of dollars of loss and lunge into the future on the chance that the future will repay what has been written off.

It is only reasonable to assume that the spring demand has saved some of this loss for many manufacturers, for it cannot be denied that cars have sold this spring despite their prices. These sales at higher prices have saved some of the loss that might have been written off at the beginning of the year.

Furthermore, it is hardly fair to contend that the slowing up in sales a few weeks ago was due to high prices. A slowing up comes every year at this time after the peak of the spring demand has passed, and that normal habit of the industry is in part responsible for the slackening in sales. The fact that made the slowing up so pronounced is that there wasn't much to slow up. The loss of a nickel doesn't mean much unless it is the loser's last nickel. Then the loss becomes very noticeable. That is, in a way, somewhat like the recent slackening in sales.

This slackening was followed by the price cuts, and there has been criticism of the industry because the epidemic began. There is room for reflection, however, for it will hardly be denied that prices had to come down before the industry could forge ahead on anything like a full-production basis. Wherefore, since they had to come down, the sooner the better, and if they all could have fallen on the same day it would have been a distinct benefit to the business. The thing that hurts is the prolongation of the price reduction period.

Some of the manufacturers who have not cut have cuts scheduled for July 1, when guarantee periods expire. Others, it is felt, have cuts in mind for later in the summer if they become necessary. Some, even those whose prices are comparatively high in the new scheme of things, say they do not intend to cut at all. The manu-

facturer who has not sufficient selling quality to offset a relatively higher price will have difficulty maintaining his dealer organization during the next year, because not all dealers are that type of super-human salesmen which can sell too high-priced cars to wise buyers.

This is an occasion when each member of the industry should look at the industry as a whole as well as at his own enterprise, for the greater stability that is effected for all manufacturers and dealers the greater will be the prosperity of even the biggest in the period that lies just ahead.

The need of the hour is for stabilization, and he who contributes to that need is deserving of the thanks of the industry and trade.



Better Fuel Mileage

FOR many years the automotive industry, the dealers and car owners alike have talked over the matter of fuel economy and when we check up present day performances one might easily come to the conclusion that all the problems have not as yet been solved.

One of the first things to be considered when we bring up the subject of fuel economy is car performance. When you ask the average American car owner which he would rather have, more gasoline mileage or the ability to "get away" and "make her step," the answer will invariably be the latter. In other words, our car designers, engine builders and carburetor experts hesitate to do anything in the way of fuel saving which might possibly cut down performance. They are giving our American public exactly what it wants.

The recent French fuel trial held at Le Mans proved some remarkable feats and there is much to be gained from events of this kind which can be of use to our designers and builders in determining the next year's lines of development. Because some of the European cars hung up some startling fuel records is not to be taken as an assumption that every car of a similar weight and piston displacement can duplicate it. But it does show what it is possible to do when efforts are concentrated along one line.

Fuel economy does not essentially mean cutting down the gas mixture to as lean a state as possible, although this is desirable at times. If we are to get real fuel economy our engineers probably will go after such things as combustion chamber design, light reciprocating parts, lighter cars, simplified chassis, and similar things, all of which might make a car roll easier and by virtue of the light weight give more miles to the gallon and with smaller and more efficient engines not cut down performance.

Some excellent results have been obtained by various engine makers in the last year in the way of increasing engine efficiency and while many of these results have been obtained chiefly in the laboratory, it is reasonable to expect that we shall see many of them commercialized before long in our cars, trucks and tractors.

Dealers Want Fixed Prices

With Stable Market Values for Cars Nothing But Prosperity Faces Automobile Industry

NEW YORK, June 13—Justification is hard to find for the gloom which permeates the manufacturing end of the automotive industry at this time. Fundamentally, general business conditions are more stable and the outlook is more hopeful than for more than a year. Ultimate recovery in the automobile field is more dependent now on the general business trend than it has been at any time since deflation began.

The automobile business this month will be better than most manufacturers expect it to be. There is little doubt that June sales will equal those of May and they will approximate those of April. This will be true particularly in lines which have stabilized prices. The result will be, unless production in the last two months considerably outran orders, that factories will have to begin turning out motor cars again in a few days. Those which are producing may have to increase their schedules. That seems to be the outlook for this month.

ALWAYS TWO DULL MONTHS

July and August always are the duller months in the year for the sale of automobiles. The reasons for this condition are obvious and everyone connected with the industry is thoroughly familiar with them. There is no reason to believe there will be any great deviation this season from the normal state of affairs. If there is any it probably will be on the side of an unusually good July business as compared with June.

August undoubtedly will follow the usual trend and there will be the perennial slump. Unless all signs fail sales will pick up in September and by the middle of that month factory operations should be well under way. There is every reason to believe that general conditions will become steadily more stable and by that time they should be auspicious enough to warrant confidence that the automotive industry will have entered upon a long period of prosperity. There will be no tremendous leaps forward, but the volume of sales should increase steadily each month, with due allowance for the usual seasonal fluctuations and spasmodic ups and downs in different sections of the country.

By mid-September the south and the great agricultural sections of the middle west will be coming into the market for motor vehicles. The outlook for the farmers and planters is brighter than it

Who Said "Gloom?" There Is None

FUNDAMENTALLY, general business conditions are more stable and the outlook more hopeful than for more than a year.

Business will be better than manufacturers expect in lines where prices have been stabilized.

Beginning September 1 the volume of sales should increase steadily.

Dealers make no secret of their alarm in their loss of friends caused by unsettled prices.

has been for months. They probably will not buy in the usual volume before the fall of 1922, but sales resistance among them will be broken.

If there is any lack of stabilization in the industry by that time it will be largely the fault of the manufacturers themselves. In this respect there is a growing feeling of alarm among the dealers and they have no secret of their apprehension. There are hundreds of dealers who have lost friends and patrons because the makers of the cars they sell issued positive statements setting forth reasons why it was impossible for them to cut prices and then, only a few days later, announced reductions. This action hurt in lines which had given no guarantees.

PRICE REDUCTIONS HAD TO COME

Only a month ago manufacturers in Detroit were professing indignation at any suggestion that it might be possible to reduce prices. They were pointing to high material costs and unprecedented overhead. Yet everyone who had a real grasp of the trend of economic events knew that price reductions were inevitable.

Dealers are not crying for price reductions. They are vastly more concerned in having prices stabilized. If their manufacturers will take a firm stand on present prices and prove that they are giving value received, the dealers will be entirely satisfied. What they want is to get the price question settled one way or the other for a reasonable length of time so they can take their coats off and go to work without the feeling that they are perjuring themselves every time they tell a prospect there will be no further price adjustments.

The chief concern of far-sighted manufacturers and dealers at this time is that the industry will drift into a situation closely akin to a price war with reductions coming at frequent intervals. Such a condition would be fatal to business for months to come.

If there are any manufacturers who feel they can make a comparatively small reduction now to be followed by another in the early fall if sales are not satisfactory in the meantime, they are their own worst enemies. They will be serving themselves and the industry best if they make NOW whatever price adjustments they intend to make in the comparatively near future.

STABILIZATION NEEDED

Normal conditions never can be restored in the United States until prices are stabilized. This stabilization is approaching in many industries and it is the most encouraging sign of the times. It is what the automotive industry needs more than anything else. There are many persons who are able to buy and want to buy who will not buy unless they are convinced they cannot get the goods they want considerably cheaper in the near future than they can now.

All forecasts of prosperity for the automotive industry must be predicated on the understanding that there will not be periodical price reductions. Business will be done on a falling market for a long time to come and the retail prices of automobiles will gradually decline but there is no sense in readjusting them oftener than once a year. When readjustments are made there should be concerted action by the manufacturers and the atmosphere should be cleared in a fortnight rather than have the period of uncertainty continue for two or three months, thereby unsettling trade.

It should be remembered also that purchasers are giving greater attention to values than they have in the past three or four years. They want their money's worth, and the manufacturer who can convince them they are getting it will do a better business in the long run than the competitor who cuts prices and takes value out of his product.

CHICAGO ASSOCIATION MOVES

The Chicago Automobile Assn. has moved from its old quarters at 2136 to 2508 South Michigan avenue, where it occupies the second floor of the Fisk Rubber Co. building. The rapid growth of the association is responsible for the new location which has four times the floor space occupied at the old address.

Unsatisfied Demands for Fords Inspire Reductions

Unprecedented Market for Cars Increasing Production, Makes New Price Level Possible

DETROIT, June 9—The new Ford reductions are not nearly so sharp as those last fall which started the automobile price decline but they mark a considerable step toward bringing Ford models back to the levels which prevailed before the war. The reductions range from \$15 on the stripped chassis to \$50 on the coupe and truck.

Cars	Old Price	New Price
Chassis	\$360	\$345
Roadster	395	370
Roadster, with elec. starter	465	465
Touring	440	415
Touring, with elec. starter	510	510
Sedan (starting system and demountable rims)	795	760
Coupe (starting system and demountable rims)	745	695
Trucks		
Chassis	545	490

The following statement was made in announcing the lower prices:

"The big reductions last fall were made in anticipation of lower raw material costs of which we are now getting the benefit and this fact together with increased manufacturing efficiency and an unprecedented demand for Ford cars, particularly during the last three months, permitting maximum production, have made possible another price reduction immediately.

Demand Exceeds Supply

"Ford business in April and May was greater by 56,633 cars and trucks than for the same two months last year. In fact the demand was even greater than the supply so that output has been limited, not by unfilled orders, but by manufacturing facilities. During May we produced 101,500 cars for sale in the United States alone making it a record month in the history of our company and our factories and assembly plants now are working on a 4,000 car daily schedule for June.

"The Fordson tractor still is being sold at less than the cost of production on account of the recent big price reduction and it is impossible therefore to make any other cut in the price of the tractor."

The announcement also was made that the wages of Ford workmen will not be reduced as the result of the price cut.

While the latest Ford reduction was not so unexpected as that made last fall, other manufacturers had not expected price readjustments by this company for a month or two yet.

DENIES PLANT WILL CLOSE

In supplementing the statement in connection with price reductions and denying reports that the plant will close, Henry Ford said:

"It has been the custom of the plant to release men during harvest time so grain could be cared for but since there

is an abundance of farm hands this year, this will not be necessary."

Ford said the plant was running far behind orders and that he expected to keep up the present production schedules indefinitely.

The Ford Motor Co. of Canada has announced a price cut of \$65 on open cars and roadsters and \$110 on enclosed cars. This makes the price of the touring car without starter \$710.

New Prices Bring Flood of Cash

QUINCY, Ill., June 9—Buyers are coming into the automobile market with hard cash, according to R. H. Patterson, local Overland dealer. "I've seen more honest to goodness business in the last two weeks than in the last two years," is the way he expresses it. Buyers are coming into the market with free money and taking out cars without chattel mortgages and promissory notes. General continuance of this condition is forecast as indication that the public recognizes that the trade has reached rock bottom prices.

FOUR MORE REDUCE PRICES

New York, June 10—Brewster & Co., Long Island City, have reduced prices on the roadster and 5-passenger models to \$7,000. The cars formerly were listed at \$7900 and \$9000 respectively. No change is made in the enclosed car prices.

Norwalk Motor Car Co. Inc., of Martinsburg, W. Va., makers of the Norwalk car, have reduced the price on its 5-passenger model from \$1285 to \$1135.

Raleigh Motors Corp., Bridgeton, N. J., has reduced prices on its 3 and 5-passenger models from \$2750 to \$2250; on the coupe from \$3600 to \$3100, and on the sedan from \$3700 to \$3200.

Birch Motor Cars, Chicago, has reduced prices on its roadster and 5-passenger models from \$1695 to \$1595.

COLUMBIA REDUCES PRICES

Detroit, June 9—The Columbia Motor Car Co. has announced a price reduction on all models averaging \$350. The new prices are to take effect at once.

23 Makers Says Old Prices Are to Hold During 1921

Replies Are in Answer to Telegram Sent by Secretary of N. A. D. A.

ST. LOUIS, June 9—Automobile manufacturers are pretty well agreed that the best way to stabilize the market is by a definite determination of price according to replies received by Harry G. Moock to his telegram May 31 to the manufacturers asking them to determine whether they were going to reduce, raise or stand pat and let the public know exactly what might be expected. Replies have been received from more than 50 manufacturers, embracing leading makes, stating what the companies' policies will be and that that policy will be adhered to.

"I want to emphasize at this time," Moock said, "that my telegram of June 2 was not a request to manufacturers to reduce their prices. That's a matter that the factories only can determine, but the important thing which I sought to bring out in that request was that the public must be made to understand the situation. If a manufacturer is going to cut, let him cut now. If he is going to raise, let him raise. If he is going to stand pat, let him stand pat. But tell the public what you are going to do and stick to it, was the tenor of my message."

"Manufacturers who announced that they would maintain present prices are Haynes, Milburn, Rauch-Lang, Briscoe, Commonwealth, Cadillac, Maibohm, Daniels, Grant, Brewster, Pilot, Caz, Cunningham, Chandler, Detroit Electric, Apperson, Rand. V. Knight, Dorris, Mercer, Locomobile, Crow-Elkhart and Auburn.

"From the following, replies were received that just as soon as an announcement was practicable it would be made: Sayers, Roamer and Stutz."

KISSEL REDUCES PRICES

Hartford, Wis., June 10—Price reductions of \$500 have been made by the Kissel Motor Car Co. on the coupe and sedan of the standard model line, bringing the new price to \$3,775. The 7-passenger touring and the tourster remain at \$2,775 and \$2,975. The one-ton truck chassis is reduced from \$2,175 to \$1,585.

Table Showing Range of Prices on Ford

	Aug. 1	Sept. 21	Oct. 16	Feb. 25	Aug. 16	Mar. 4	Sept. 21
	1917	1917	1917	1918	1918	1920	1920
Touring	360	365	365	450	525	575	440
Roadster	345	350	350	435	500	550	395
Chassis	333	338	338	400	475	525	360
Coupelet	505	510	560	560	650		
Coupe						*850	*745
Town Car	595	600	640	640			
Sedan	645	650	695	695	775	†975	*795
Truck	600	600	600	600	550	600	545

*Includes starter and demountable rims.

†With pneumatic tires and demountable rims.

Makers Refuse to Disclose June Production Schedules

Unsettled Conditions Resulting From Price Changes Given as Cause of Indefinite Plans

DETROIT, June 13—Price cuts and generally unfavorable business conditions have deterred manufacturers in most instances from outlining definite production schedules for June. In fact in only 7 companies have schedules been fixed for the month and in only four of these are they increased over May. Ford, which went over the 100,000 mark by approximately 2,000 in May, has scheduled another 100,000 for June and up to the present time has been successful in that production. Lincoln, which built 425 in May, has scheduled 400 for June. Cadillac and Packard have announced definitely increased June schedules, the former planning to build 1,600 against 1,400 in May, and Packard plans 1,000 single Sixes against 800 produced in May. Chevrolet also will increase its schedule in June about 1,400 and Studebaker approximately the same.

Dodge Brothers was closed down Monday but opened again Tuesday and has been running daily since then and officials declare the plant will continue to operate uninterruptedly despite the many rumors that the big factory will close down for an indefinite period in the near future. Dodge officials decline to say what production schedule will be maintained or the schedule as to working days beyond the statement that they expect to continue without interruption. In the face of the statement from Vice-President Layng, of Cadillac, that production would be increased this month, rumors are current that Cadillac will close June 15. This is denied by factory executives.

There is an apparent tendency to move cautiously as regards production, and except in those factories where definite schedules have been announced, production will be based wholly upon current sales demand. In spite of the figures a careful check of the factories indicates that production for June will not be more than 60 per cent of May. Hupp now is building from 75 to 80 cars daily, but officials of that plant admit frankly that as soon as production reaches current demand, the plant will slow up and perhaps close down temporarily. Hope was expressed at the Buick plant of topping the May figures although no definite schedule has been fixed.

Timken-Detroit Axle Co. officials had planned to close the factory July 1 for one month and allow all executives to take their vacations simultaneously, but conditions which have arisen have made the shut-down problematical, and General Manager Fred Glover said it was possible the plant would continue to operate. This, of course, is dependent entirely upon conditions which will arise between now and July 1, he said. In

the event the Ford plant closes down, as is rumored, many other manufacturers are expected also to stop for a month or two at least, though no definite information can be secured, everyone apparently waiting for some indication of the Ford plans.

Continental Motors is laying off men in the sales and other departments indicating a general slowing up and there are reports that this plant also will close for a period this summer though no statement can be secured from officials in this connection. The same is true of Liberty Starter Co. In fact, it is rumored all over Detroit and is the confident belief in many quarters that there will be a general shut down around July 1.

Factory officials who are refusing to make any predictions appeared to regard that as a remote possibility, and some of them declare that the effect of the recent price reductions, now that practically every company has joined in the movement, will have a tendency to stabilize the market and create a buying period which was interrupted by the first price slash more than a month ago. They contend the first price cuts and the delay on the part of most of the other manufacturers caused a feeling of uncertainty that prompted the public to give up all idea of buying until every company had stated its position definitely and the market again had become stabilized.

BUICK TO CONTINUE 1921 SIX

Detroit, June 11—In connection with the Buick announcement of its revised prices, attention has been called to the fact that no changes will be made in the sixes for 1922; that is, the 1921 series will be carried through the 1922 season without any changes whatever. The Buick company, however, will announce a four-cylinder car in August. Details of this are not as yet available.

DODGE NAMES BIG REDUCTION

Detroit, June 10—Dealers were notified June 8 by the Dodge Bros. Motor Car Co. that sharp reductions in prices would become effective immediately. It had been expected that some action on prices would be taken soon but the cuts were deeper than dealers anticipated. Following are the old and new prices:

	Old Price	New Price
Touring car	\$1285	\$985
Roadster	1235	935
Coupe	1900	1585
Sedan	2150	1785
Screen side express wagon.....	1270	1085
Panel delivery wagon.....	1350	1135

SAXON REDUCES PRICES \$180

Detroit, June 12—The Saxon Motor Car Corp. reduced prices effective June 12 on all models. Open and closed models are now \$400 to \$500 less than they were last year. January 1 Saxon-Duplex prices dropped from \$220 to \$320. Now with the additional reduction of \$180 the new prices are \$400 to \$500 under 1920 prices.

New York Dealers' Sales Exceed Early Predictions

Record Placements Follow Price Reductions in Many Lines. Buick, Studebaker and Dodge Leaders

NEW YORK, June 11—There are a good many indications that the New York territory will have a good passenger sales record for June. There is still considerable confusion and some distrust in the public mind over price reductions, but there is increasing evidence that buyers are inclined to accept cuts already made as representative of present day values, based on material and labor costs. Several cars which have had substantial price reductions since the first of May are selling so strongly that the total sales record for May and June will be decidedly respectable, despite the fact that a few of the unreduced lines are having a hard time of it.

This week ended with Buick, Studebaker and Dodge Brothers leading in day to day sales. Buick and Studebaker have both been selling strongly and their price reductions served to prevent any falling off in business as a result of reductions in competing lines. Dodge had been selling indifferently for some time and dropped off materially when Buick reductions were announced. Then, when the Dodge reduction came this week, sales jumped skyward, and daily sales of the last half of the week are far ahead even of the records made when the Dodge car first made its appearance in New York. Marmon, Jordan, Franklin, Oakland, Maxwell, Chevrolet and Ford have had good business since their announcement of recent reductions, and several other cars whose sales picked up, though not so noticeably, are still doing better than they were in May. Several cars which announced price reductions early in May have dropped off considerably from the sales spurts which immediately followed the reductions, but business is better than it was early in the spring.

Salesmen are finding some prospects reluctant to buy because the multiplicity of price reductions spread over a considerable period has created in their minds an impression that still further reductions may be looked for on cars already untouched. However, these people are not in the majority.

Studebaker and Buick are both behind on deliveries and some orders have been cancelled and have gone to dealers in other cars, because of this fact. Several other lines also are short of certain models and there have been some cancellations, the public showing little patience with delays when it is possible to obtain second or third choice cars.

Reports from the motor vehicle office of the secretary of state at Albany indicate that the April sales figures will prove much larger than was expected when the month ended. Compilation of registration is always considerably behind and there was a big rush of registration during the last 10 days of May.

Sales Managers Disapprove "Factory to Consumer" Plan

Agree That Efficient Dealers Organization Is Best Method For Marketing Motor Trucks

DETROIT, June 11—Voicing their unqualified disapproval of the "factory to consumer" plan of selling motor trucks, directors of the National Association of Motor Truck Sales Managers, meeting here, adopted resolutions pledging aid and cooperation for dealers, and efforts to discourage development of the direct sale plan. The attitude of the new directors was unanimous according to Don F. Whittaker, general manager of the association. The adoption of the resolution coming after the resignation of W. N. Ackerman as director and the Lewis Hall Iron Works as member. Mr. Ackerman is general manager of the truck division at Lewis-Hall.

The sales managers declare they are concerned with the interests of the dealer as well as the consumer; with the former in seeing that he gets a legitimate profit and the latter prompt and efficient service. The directors took the position that manufacturers, confronted by sales resistance, should endeavor to overcome adverse conditions by readjustments of distribution and dealer organizations and rejuvenation of sales system, rather than by destroying the dealer organizations and eliminating the real point of contact between the manufacturer and the consumer and attempting to operate direct from the factory.

Fred Glover, general manager of the Timken Detroit Axle Co., G. W. Yeoman, vice president of the Continental Motors, and others, were invited to address the meeting and presented their views. Following the lengthy discussion and the resignation of Ackerman and the election of J. F. Bowman, sales manager of Garford, to succeed him, the resolution was adopted. It provides that:

"whereas certain procedure has promoted the best interests of manufacturers and certain sales policies have shown tangible and definite results the association will not endorse or approve any sales and service plan which will take from motor truck dealers the profits to which they are entitled, realizing that such methods ultimately will be to the detriment of the consumer in that they will seriously affect proper servicing," the resolution further declared that the association "will aid and support dealers in their efforts to give prompt and efficient service, possible only through direct contact between dealer and consumer and will discourage the 'factory to consumer' method of merchandizing trucks in the belief that the plan is impractical in that satisfactory service cannot be rendered, resulting in injury to the industry

and great detriment to the interests of dealer and consumer."

The development of plans for standardizing the location of truck chassis numbers to prevent fraudulent practices of unscrupulous persons in dealing with finance companies; determination to investigate the used car clearing house with the view to advocating extension all over the country if shown to be successful and plans for giving further assistance to the N. A. D. A. in securing the united support of truck dealers and their full cooperation in eliminating improper sales and discouraging sales to persons not financially responsible were taken up and acted upon following the discussion and action on the direct selling plan.

Dealers in Louisville Employ Paid Secretary for First Time

Louisville, June 10—The first regular monthly dinner meeting of the Louisville Dealers' Association for the summer was held Wednesday. William O. Portman of the Leyman Motor Co. spoke on the subject of "Used Cars" and Frank Sullivan of the O. K. Motors Co. on "Credits." Other members took part in the general discussion of both subjects.

The directors of the association have elected George T. Holmes secretary succeeding C. L. Alderson. Mr. Alderson, who has held the combined offices of secretary-treasurer and who is the manager of the Standard Auto Co., will continue as treasurer. This is the first time the directors have gone outside their own membership and employed a paid secretary. The change in policy is in line with what the directors say will be a general increase in activity not only in the association work but in the automobile business as well. Plans of those in charge of activities include a complete credit system which will be maintained in the secretary's office for the general information of members.

TO AMEND CONDON BILL

Lansing, June 10—An amendment to the Condon Automobile Title Bill passed by the recent legislature and signed by the governor, will be necessary to make it effective as the result of the investigation by the state legal department. Under the terms of the bill every car owner must have a certificate of sale and ownership in his possession, and this is impossible in the case of time sales. An amendment is being drawn up to remedy this evil, and will be introduced at the special session of the legislature to convene this week to take up the matter of soldier bonus.

DISCUSS TIRE PROBLEMS

Indianapolis, June 10—At the regular meeting of the Wayne County automobile dealers' association, problems relating to the marketing of tires and the dealers' relation to the buying public were covered in an interesting address by Joe Kuppman, of the Richmond Tire Co. Another feature of the talk concerned the matter of service to the public.

Duesenbergs Leave Racing For Stock Car Production

Cars to Race in France Not Entries of Company But of American Automobile Associations

INDIANAPOLIS, IND., June 9—L. M. Rankin, vice-president and general manager of the Duesenberg Automobile Co. here, said today that the Duesenberg company was abandoning racing and after the Grand Prix and the Uniontown race the energies of the company will be devoted entirely to the production of stock machines. Any race entries hereafter containing Duesenberg engines will be private mounts.

In connection with the announcement of this policy, it became known that the Duesenbergs are not being taken to France by the Duesenberg company but with money raised by various national automobile associations, who are borrowing the cars for the race. As a result, the Duesenbergs are virtually America's entries in the big European race. Funds to send these cars were raised with the sanction of Richard Kennerdell, chairman of the contest board of the American Automobile Assn.

Cars Leave With Support of Association

The cars go to Europe with the moral and financial support of the automobile associations of the country, and with the backing of the city of Indianapolis, evidenced in a letter just sent to B. A. Worthington, president of the Duesenberg company, by John B. Reynolds, general secretary of the Indianapolis Chamber of Commerce. The letter was the result of the showing made by the Duesenbergs in the recent Motor Speedway races here, where four of the six machines finished in the money and one in second place.

Mr. Duesenberg says the company will stick to the eight-in-a-row motor in stock cars. The Duesenberg models will be priced from \$5,000 to \$8,000 and will include a complete line of open and enclosed models. The body designs are now being perfected and are the creations also of the Duesenberg brothers.

The company is headed by B. A. Worthington, president, who is also president of the Cincinnati, Indianapolis & Western Railroad, and chairman of the industries committee of the Indianapolis Chamber of Commerce. L. M. Rankin, vice-president and general manager of the company, is an executive and sales manager of long experience. F. A. Reilly, secretary-treasurer, is an attorney who has come to the company from New York.

ELECTS S. A. E. OFFICIALS

Minneapolis, June 9—The Minneapolis section of the S. A. E. has elected officers as follows: President, W. G. Clark; vice-president, C. E. Moody; secretary, C. T. Stevens; treasurer, J. S. Clapper.

New Orleans Dealers Seek Used Car Dealers' Proposition

**Situation in South Made Difficult by
Old Method of Trade-Ins
on New Cars**

NEW ORLEANS, La., June 14—The Automobile Dealers' Assn. of New Orleans has decided to investigate the used-car situation thoroughly, and, if possible, find a system for the handling of used cars in which all the dealers of New Orleans can join. At a meeting held June 7, and attended by about 90 per cent of the New Orleans dealers, a committee of five leading dealers was named to make an immediate survey of the situation and report at an early meeting of the entire membership of the association.

It is the opinion of New Orleans dealers, and of dealers in Shreveport, La., and Jackson and Meridian, Miss., that the city dealer in the south is in better condition in regard to used cars than is the country dealer. The price of used cars has shown a falling off in New Orleans and other centers of population in Louisiana during the past 60 days, indicating that the dealers not only are trying to liquidate some of their stocks of used cars, but that they also are allowing less on used cars when turned in as part payment on new ones.

Dealers Overloaded With Used Cars

The Louisiana and Mississippi country dealers complicated their own used-car problem about a year ago, when they thought they saw a tremendous trade increase in the large number of used cars offered in part payment for new cars. In other words, every man who had a used car and offered it as a first payment on a new car got the new car. This condition, while it existed only about six months, overloaded the country dealers with used cars. The city dealers, though offered many used cars, kept prices down on them, and refused to accept them without some cash on the first payment. This has left the city dealers with fewer used cars—and used cars cost them less money—than the country dealers. Several of the city dealers also have held special sales of used cars, lasting from two or three days to a week or more, and, according to New Orleans dealers, these special sales helped materially in moving the rebuilt cars.

Truck and tractor sales throughout both Louisiana and Mississippi are reported as holding up rather well, partly on account of the planting season just coming to a close, and because both states are working steadily on the building of new roads and the improvement of those already in existence.

One of the methods known to be under consideration by Chairman Cathey and his committee is that of establishing once a month a series of prices for used cars, graded according to make, age and

condition. The dealers will be asked to follow this schedule in taking in used cars. Some of the dealers also are asking that a margin of profit be fixed, so that each dealer will offer his rebuilt cars at approximately the same price. This, however, is not meeting with the general approval given the plan to fix the intake prices.

Ford Breaks 8 Production Records Within 20 Days

Detroit, June 9—While the Ford plant is breaking records with startling frequency in the matter of car and truck production at Highland Park and the assembly branches, the body plant at River Rouge is busy and today is turning out about 1,200 sedan and touring car bodies daily. About 2,000 men are employed and it is significant that the time per job now is much less than when the body output was less than half what it is today, due to increased labor efficiency.

All departments of the Ford company are working full time—three eight-hour shifts—and there are today 43,000 men on the Ford payroll. Highland Park during May turned out an average of 4,032 cars daily and that will be kept up through June. On May 11th 4,096 cars and trucks were turned out and six days later a mark of 4,107 was reached. May 20 a new high mark of 4,144 was made. This made the eighth time in 20 working days that production records were broken.

SACRAMENTO RUN IN JUNE

Sacramento, June 9—The Annual Economy and Reliability Run of the Sacramento Motor Car Dealers' Association, will be held about the middle of June. The exact date depends upon the opening of the roads over the Sierra Nevada mountains. The run, initiated last year, covers the route to Lake Tahoe over the Placerville road, returning by the Truckee route. Neither road is yet open, due to the unusually heavy fall of snow last winter and the cool spring. It is planned to hold the run as early as possible to avoid the heavy tourist travel. The run is made for the Sacramento Bee trophy, and was won last year by the Stephens.

MARKETS NEW SCRIPPS-BOOTH

Detroit, June 14—Shipments are now starting on the new Scripps-Booth six. This is an assembled car incorporating a Continental 7 R 3½ by 4½ engine, Borg & Beck clutch and other standard units. The new car is mounted on a 115-inch wheelbase and is featured by extraordinary long spring suspension for its wheelbase, its combined length of springs being 184 inches. The tires are 32 by 4 inch cord and the Alemite lubricating system is included. The prices are \$1,490 for the touring car; \$1,475 for the roadster; \$2,375 for the sedan and \$2,350 for the coupe.

Moore Motor Vehicle Co. Officials Are Found Guilty

**Claim Made That Mails Were Mis-
used in Sale of Stock
to Public**

ST. LOUIS, June 10—A verdict of guilty of using the mail to defraud in the case of five former officers and a former stock salesman of the Moore Motor Vehicle Co., of Danville, has been returned. The case has been on trial for four weeks. The charge arose from their sales of stock in the company.

The convicted men are George L. Moore, of Los Angeles; Edward G. Gallagher, of Minneapolis; Albert C. Leonard, of Denver; John F. Bichl, of Chicago; James H. Vickers, of Harvard, Ill., and J. W. Patt, of Salt Lake City. The latter was a stock salesman; the others were officers of the company at some time between 1916 and 1920.

Attorneys for the defendants made a motion for a new trial.

Moore, Gallagher and Leonard conducted an automobile plant at Minneapolis from 1915 to 1917 when George Wilson, a promoter, suggested that they incorporate, sell stock and produce automobiles on a large scale. The Minneapolis company, known as the Moore Motor Co., was incorporated for \$50,000. The Moore Motor Vehicle Co. was incorporated under the laws of South Dakota for \$5,000,000 and the company purchased a plant at Danville, Ill. Wilson obtained a contract whereby he had the exclusive sale of the stock. During the trial it was stated that the company received about \$906,000 from the sale of stock. About \$466,000 was accounted for on the company's books.

NEED OTHER INSURANCE METHODS

New York, June 10—Increases in automobile insurance rates during the past few months have again directed the attention of automobile manufacturers and dealers to the need for a mutual insurance company to care for motor cars and motor trucks similar to the one launched four years ago. It is asserted by the National Automobile Chamber of Commerce that loose methods of accepting risks without due regard to the moral hazard and excessive overhead expenses have resulted in the imposition of rates from which the only relief lies in the furthering of plans for mutual companies or for dealer organizations which are now actively under consideration.

WILLIAMS LEAVES LINCOLN

Detroit, June 10—Lincoln Motor Co. has lost one of its important executives in the resignation of Le Roi J. Williams, counsel and assistant to the general manager. Williams has been associated with Henry M. and Wilfred C. Leland for six years, and has been identified prominently with their officers both at the Cadillac and the Lincoln.

Bank's Gold Now Ready to Aid Legitimate Industry

Governor Harding of Federal Reserve Says Financial Institutions Are in Best Condition

NEW YORK, June 9—"The emergency of 1920 has definitely passed," said W. P. G. Harding, governor of the Federal Reserve System, speaking before the annual meeting of the National Automobile Chamber of Commerce recently. "There is nothing as far as the financial condition of the country is concerned as affected by the Federal Reserve Banks that causes any other feeling than one of optimism."

Availability of credit, the fact that automobile shipments for the past two months equaled 67 per cent of the same months of last year, the feeling that prices have reached a new stable level, and Governor Harding's statement that "the public has a great deal of buying power left" were major points of the meeting.

Governor Harding pointed out that the financial situation of the Federal Reserve System is stronger than it has ever been before, and that the banks are anxious to lend to legitimate business.

Public Has Buying Power

"We want to get the public out of the idea that things are constantly going lower and lower and lower," said Governor Harding, "and we should get some stability into the situation." It was the opinion at the meeting that the new low price levels now reached would probably be stabilized on the present basis as almost all the motor companies have readjusted their prices. The consensus of those present brought out that motor car and truck companies have anticipated the lower levels of raw materials and have priced their product on the new basis.

"The public has a great deal of buying power left," said Governor Harding, "and buying power begets buying power. You start up one industry and you automatically start up another. It is amazing when you consider the automobile industry to find how many things are dependent upon its prosperity. It affects the purchases of steel and all the processes of steel manufacture. See how much employment that gives to labor."

The automobile market is a leader in return of buying, reports at the meeting brought out. The May shipments exceeded April by 13 per cent and April and May shipments were 67 per cent of the same months of last year, comparing favorably with the steel market, with pig iron which is on a 50 per cent basis, and with rail transportation which is on a 60 per cent basis.

"The Federal Reserve Banks," said Governor Harding, "which are the ultimate resource of all member banks, and, through them, of the public are in a position now better than ever before to ex-

tend to all legitimate business all assistance needed and are not only in position to do that but are anxious for business to avail itself of it.

"The Federal Reserve System has no desire other than to be a help to business, and all paper which is eligible under the Federal Reserve Act—that is notes, drafts and bills of exchange issued or drawn for commercial, agricultural or industrial purposes—is eligible for rediscount at any Federal Reserve Bank upon the endorsement of a member bank. There are no discriminations in the Federal Reserve System against any class of paper which is eligible and all applications for rediscount will be considered in a business way upon their merits."

Motor Vehicles in Oregon in 1905, 218; Last Year, 103,190

Portland, June 10—The use of motor vehicles in Oregon jumped from 218 in 1905, when the state automobile department was inaugurated, to 103,790 in 1920, a period of 15 years, according to a report sent out by Sam Koser, secretary of state. From 1915 to 1920 the increase was from 23,585 to 103,790, the cars during that period nearly doubling in number every year. In the same period, the report shows, fees collected from licenses increased from \$108,881.50 in 1915 to \$2,085,168.50 in 1920.

The state did not begin to collect fees on automobile registrations until 1907, and in that year total receipts were \$708. Annual registration of cars were not required until 1911; chauffeur licenses not until the same year, and dealers were not licensed until 1914. The total that has been collected by the state in fees in the period of 13 years from 1907, when the first fee was collected, to and including 1920 is given in the report as \$5,813,178.

PLACES TABOO ON SHABBY CARS

San Francisco, June 9—In line with the great booster campaign carried on in San Francisco, the Motor Car Dealers' Association launched a campaign to improve the appearance of the city through the improvement of the appearance of motor cars of San Francisco. The press has taken up the fight for better looking automobiles and the dealers are making a concentrated attack on the shabby cars operated by owners of the California metropolis.

FORD'S NEW PLANT TO CLOSE TOO

Columbus, Ohio, June 10—Reports indicate that the Columbus assembling plant of the Ford Motor Co. will probably be discontinued when the new assembling plant, planned at Hamilton, Ohio, is completed. The Hamilton plant will be started soon and will cost \$400,000. It will have a capacity of 30,000 cars yearly. In the event that no changes are made in the plans both the Columbus and Cincinnati plants will be merged into the one at Hamilton.

Hoosier Owners Must Make Title to Cars or Face Jail

New Law Imposes Additional Fee of \$1 for Support of Special Police

INDIANAPOLIS, June 9—The law requiring automobile owners to take out certificates of title became effective June 4 with the promulgation of the acts of the 1921 session of the Legislature by Governor McCray. Ninety days will be given car owners to comply with the provisions of the law, dating from June 1, according to H. D. McClelland, who has charge of the automobile department of the secretary of state's office.

Automobile owners are requested to file a blank with the secretary of state setting forth information concerning the manner in which they acquired their car, the fee for such certificates being 50 cents. They are also required to make application for a license certificate container, which fee is 50 cents, this container to be placed in a prominent place on the car and the certificate showing the license number and name of the owner held therein. This makes a total of \$1 required for present car owners by the new law.

Law Requires Purchase of Container

Mr. McClelland said that in many sections of the state the idea was prevalent that the purchase of the container was not mandatory and pointed out that the law required the purchase of the container and for violation of this provision there would be a fine of from \$5 to \$100 with a jail sentence clause for the third arrest for this offense.

No applications for automobile license will be filled unless accompanied by applications for certificate of title and license certificate container. Blank certificates will not be given out except to the owner himself, although dealers and manufacturers here sought to establish services for both old and new automobile owners for taking out certificates.

Fees derived from the law are to be used in employing special state police officers to investigate automobile thefts.

TAX QUESTION NEARS SOLUTION

Washington, June 10—From mutterings heard following the meetings of the Senate Committee on Finance, although no official opinion has been offered, it is understood that the excess-profits tax will be abolished and in its place a 15 per cent tax on corporations will be substituted. It is thought the excess tax will be retained, but not increased, for a year or two at least. The surtax promises to be lowered and a number of minor taxes on which the cost of collection is heavy may be abolished. The automotive industries, through the National Automobile Dealers' Association and other national associations, have had a large part in the effort made to reduce the heavy levies on industry.

With Prices on Table Dealers Are Ready For Deal

Stand Taken by Manufacturers Has Made Situation More Stable Than For Long Time

NEW YORK, June 9—Nearly all the large production companies have taken their stand on prices and the situation in this respect is more stable than it has been in some time. Prospective buyers can go into the market with a reasonable certainty that there will be no more cuts for several months to come in the lines which have announced their attitude.

Manufacturers of parts and accessories, whose plants have been operating for two months on an approximate 50 per cent basis, have less business booked for June than for any month since February. Many releases which were given in May for this month have been countermanded and there are few reports of new business.

It is difficult to reconcile this authoritative statement of conditions among the parts manufacturers with largely increased sales in lines which have made substantial price cuts. The companies which have made price readjustments assert without exception that largely increased sales followed their announcement and investigation shows there is no reason to doubt the truth of this statement.

Since retail sales of automobiles are increasing while the business of parts manufacturers is at a standstill, the only explanation is that most companies had accumulated a considerable surplus of cars which must be liquidated before production is resumed on the scale which prevailed in April and May. There is every indication, on the other hand, that retail sales for June will equal or exceed those of May which averaged probably 25 per cent less than for April. Reports to the N. A. C. C. for May showed a gain of 13 per cent over April.

Detroit is hopeful over the outlook for the immediate future, and it is not at all unlikely manufacturers there will be more cheerful before the close of the month. There is much talk in Michigan of a general shut down in the industry July 1, but unless retail sales conditions become much worse than they are now as June progresses, there is little probability of such drastic action being taken. At the present rate of sales in most lines the present surplus soon will be absorbed and factory operations then will be expanded.

SHOW VALUE OF LOCAL FAIRS

Milwaukee, June 10—By way of showing the vast extent of the "audience" which the motor car, truck, tractor and power farm equipment reaches through the state and county fair institutions in Wisconsin, Oliver E. Remy, secretary and manager of the Wisconsin State Fair, says that in 1920 the eighty-two expositions of this nature attracted a total

aggregate attendance of more than 1,200,000 persons and receipts of \$1,075,034. Every fair devoted at least some space to exhibits of passenger and commercial cars. Referring more specifically to the State Fair, Secretary Remy said: "Attendance at the State Fair in Milwaukee has grown from 127,271 in 1915 to 327,394 in 1920. Gross receipts increased from \$75,954.80 in 1915 to \$226,367.36 in 1920. The amount of premium money paid out increased from \$47,378.20 in 1915 to \$72,732.73 in 1920."

Won't Swap Gazette for Automobile

WATERLOO, Iowa, June 9—A copy of the Ulster County Gazette, Kingston, N. Y., Jan. 4, 1800, is more highly prized by James M. DuBois than an automobile. The tattered journal contains an account of the death of George Washington. When the paper was exhibited recently a local dealer offered to exchange a car for it, but was refused.

Form Company to Take Over Estate of F. A. Seiberling

Akron, Ohio, June 11—Arrangement has been entered into by F. A. Seiberling, the former Goodyear president, and various of his creditors, it was announced today, whereby it is agreed that a corporation to be known as the Prudential Securities & Realty Co. will assume trusteeship over Mr. Seiberling's personal assets and liabilities and will manage his property, at least temporarily.

Mr. Seiberling's assets, not including his \$5,000,000 mansion, St. Anhywet Hall, which is said to be in his wife's name, are listed at \$10,136,557 and his total liabilities at \$6,700,000. Copies of the agreement with the creditors reached Akron today and under the agreement the creditors consent to an extension of maturity of debts and claims against Mr. Seiberling.

Mr. Seiberling's largest holdings include Goodyear common and preferred stock, \$2,536,430; raw rubber, \$500,000; Ladysmith Smelting Corp., \$1,681,750; Ohio Savings & Trust Co., \$144,500; Whitman & Barnes Co., \$203,500; Hotel Cleveland Co., \$45,000; Blackstone and Fairlawn Heights property, \$2,286,475; Morris Plan Bank, of Akron, \$18,000; the old Seiberling home, Akron, \$82,048; one-half interest in the Delaware building at appraised value of realty and other assets, \$943,696 equity in Central office building of Akron, \$60,000; and Summit County farm land, \$378,202.

CAMPBELL NEW SALES MANAGER

New York, June 9—Colin Campbell, for five years assistant to the general manager of sales of the Chevrolet Motor Co., has succeeded W. C. Sills, general manager of sales, who will locate in Boston, August 1, as Chevrolet distributor for New England.

Durant Engineers Place O. K. On Three New Lines of Cars

Collins Eight, Sheridan Six and Durant Four Will Be in Production Soon

NEW YORK, June 9—Important announcements by W. C. Durant regarding the future of Durant Motors, Inc., are expected in the near future. They will relate not only to production and personnel but to finances.

Plans for production are rapidly taking form. The experimental Durant cars have been completed and are satisfactory to the engineers in every respect. The "Four," which will sell for less than \$900, is reported by those who have seen it to be a high grade job. It has many refinements not found ordinarily in low priced cars.

Provision now has been made for three lines. One of them will be the Durant, another the Collins, which will be produced in the old Cadillac factory in Detroit, and the third the Sheridan. A fourth line will be added, it is understood. Durant promised the people of Flint, Mich., in January that one of his plants would be located in that city. He will keep his word in this respect and it is expected the fourth division of his company will be located there. Chassis models will be limited under the present plans but there will be several body models. The Sheridan will be converted into a six-cylinder job and the Collins will be an eight.

Preliminary steps for the building up of a dealer organization now are being taken and it is understood several contracts already have been signed. It probably will be the policy of Durant Motors, Inc., to have its dealers handle all the affiliated lines.

DEALERS' PROTESTS COME LATE

Washington, June 10—Automobile dealers throughout the country are flooding Congress with protests against the reimportation of American made trucks. The movement is not confined to the Atlantic and Pacific seaboard where sales have been heaviest but has extended to small communities in the middle west. For instance the Motor Trade Association of Riley county, Kansas, adopted a resolution urging Congress to enact legislation to prevent dumping of salvaged material from European war areas in competition with American industry. All of these protests have been filed with the senate committee on finance, but are rather late to bring effective action for the anti-dumping bill has passed Congress and has been signed by the president.

600 DEALERS IN KENTUCKY

Louisville, June 9—The automobile department of the Kentucky state tax commission has issued 91,139 passenger motor licenses for 1921, 12,549 truck licenses, 935 motorcycle licenses, 660 dealers' licenses and 7,159 chauffeurs' licenses.

When the Jobbers Meet at Mackinac

Or, rather, when the jobbers and manufacturers meet, because the Automotive Equipment Association is made up of both makers and wholesalers of the industry's supply and equipment lines. The mid-summer convention will be held July 4-9, at Mackinac Island, delegations going from Chicago and Buffalo by boat. An attendance of 600 is anticipated. The program is both work and play, and this time a whole session is devoted to merchandising, for the industry realizes that the expansion of sales is the only means of expanding the industry.

Program Spring Meeting of the Automotive Equipment Association, Grand Hotel, Mackinac Island, Mich., July 4-9, 1921:

MONDAY, JULY 4

10:00 A. M.
Board of Directors.....The Club Room
Membership Committee.....Main Parlor
2:30 P. M.
Board of Directors.....The Club Room
Membership Committee.....Main Parlor

TUESDAY, JULY 5

10:00 A. M.
Board of Directors.....The Club Room
Membership Committee.....Main Parlor
Standardization Committee.....
.....Ball Room—South
Labor Committee.....Tango Room
Vigilance Committee.....Private Office
Railroad Classification.....Casino Room
Good Roads and Highways.....
Ball Room—North.....2:30 P. M.

Board of Directors.....The Club Room
Membership Committee.....Main Parlor
State Vice-Presidents.....Casino Room

WEDNESDAY, JULY 6

Call to Order 10:30 A. M.
First General Session
Invocation by Rev. G. H. Robinson
President's Address
Formation of the House
Appointment of Committees on
Press
Credentials
Resolutions

Recess

Call to Order 2:30 P. M.
Divisional Meetings
Manufacturers' Division presided over by President Stranahan
Jobbers' Division presided over by Commissioner Wm. M. Webster

THURSDAY, JULY 7

Call to Order 10:30 A. M.
Second General Session
Invocation by Rev. Father J. A. Keul
This session will be given over entirely to an intensive Sales Campaign
No afternoon session

FRIDAY, JULY 8

Call to Order 10:30 A. M.
Third General Session
Invocation by Rev. Charles H. Hanks
Regular Order
No afternoon session

ENTERTAINMENT

Golf

Mr. Fred Campbell, Chairman.....St. Louis

Cards

Mrs. Jessie Albracht, Chairman.....Cleveland

Dancing

Mrs. N. H. Oliver, Chairman.....Chicago

Baseball and Athletic Sports

Mr. David Rosenbach.....Chicago

CHANDLER MARKS DOWN MODELS

Cleveland, June 13—Beginning today Chandler prices are reduced to the level of 1913, which represents a reduction of \$195 on each of the seven models. The new and old prices are as follows:

	New	Old
Seven-passenger touring.....	\$1,785	\$1,980
Two-passenger roadster.....	1,785	1,980
Four-passenger roadster.....	1,785	1,980
Four-passenger dispatch.....	1,865	2,060
Seven-passenger sedan.....	2,885	3,080
Four-passenger coupe.....	2,785	2,980
Limousine.....	3,385	3,580

The price of the Cleveland cars, which are made in a factory in which there is much Chandler money, have been reduced. The new prices effective at once are: Cleveland Six, \$1295 for both the five passenger touring and the three passenger roadster; five passenger sedan, \$2295; and four passenger coupe, \$2195.

I. H. C. LOWERS TRUCK PRICES

Chicago, June 14—The International Harvester has reduced prices on its heavy duty motor truck as follows: 1-ton truck, from \$2,160 to \$1,874; 1½-ton, \$2,425 to \$2,032; 2-ton truck from \$2,960 to \$2,395; 3-ton truck from \$3,450 to \$2,750; 5-ton truck from \$4,500 to \$3,600. A 25 per cent reduction on cab bodies, tops and other accessories is also announced.

MONROE AND BOUR-DAVIS REDUCE

New York, June 13—Price revisions on Monroe cars, made by William Small Co., Indianapolis, reduce Model S 9-10 in both 2-passenger and 5-passenger from \$1,440

to \$1,295, and Model S 11-12, coupe and sedan, from \$2,400 and \$2,500 respectively, to \$2,075 and \$2,175.

Bour-Davis, made by the Louisiana Motor Car Co., Shreveport, La., has been reduced from \$2,585 to \$2,385 in both the 3-passenger roadster and 7-passenger touring.

WHITE LOWERS TRUCK PRICES

Cleveland, June 14—Effective immediately, reductions ranging from \$500 on the 5-ton model to \$200 on the ¾-ton truck have been made by the White Company. The old prices compared to the new are as follows:

	New	Old
5-ton.....	\$4,500	\$5,000
3½-ton.....	4,200	4,500
2-ton.....	3,250	3,450
¾-ton.....	2,400	2,600

BESSEMER TRUCK REDUCES

Grove City, Pa., June 10—Price reductions ranging from \$400 to nearly \$1000 are announced by the Bessemer Motor Truck Co. The 1-ton truck has been reduced from \$1700 to \$1395; the 1½-ton from \$2445 to \$1995; the 2½-ton from \$3285 to \$2595; and the 4-ton from \$4485 to \$3495. Prices are f. o. b. factory.

AMERICAN NAMES NEW PRICES

New York, June 9—Price reductions ranging from \$200 to \$345 have been made by the American Motors Corp., Plainfield, N. J., manufacturers of the "American Balanced Six." The new prices are: Sedan, \$3150; 4-pass. sport, \$2350; 7-pass. touring, \$2275; 5-pass.

touring, \$2195; roadster, \$1195. Former prices on each of these models were \$3495, \$2595, \$2475, \$2395, 2395. The new prices are guaranteed until Jan. 1, 1922.

WILL MAINTAIN LEACH PRICES

Los Angeles, June 9—That there will be no reduction in the price of the Leach Power Plus Six, especially since the downward trend has been almost entirely among the lower priced machines, has been definitely declared by M. A. Leach, president of the Leach Biltwell Motor Car Co., of Los Angeles. The high-grade car prices have been maintained generally and the Leach company is following the policy set forth by other manufacturers.

WILSON TRUCKS COME DOWN

Detroit, June 14—A reduction in the prices of all models of Wilson motor trucks is announced by the J. C. Wilson Co. Four sizes of trucks are made by this company and the reductions in prices range from \$380 on the 1½-ton model to \$755 on the 5-ton truck. The new and old prices are as follows:

	Old	New	Reduction
1½ tons.....	\$2650	\$2270	\$380
2½ tons.....	3300	2825	475
3½ tons.....	4300	3685	615
5 tons.....	5275	4520	755

These price reductions go into effect at once.

NEW PIEDMONT PRICES

Philadelphia, June 10—The new price on the Piedmont four-cylinder car is \$1,275 and on the six-cylinder \$1,495.

Better Service Is Aim of Cooperative Educational Campaign

N. A. D. A. Fostering Plan to Teach Service Men and Mechanics—Unit Manufacturers Lending Valuable Aid

TIME was, before the automotive industry was even in its infancy, when there was a strong tendency toward the formulation and jealous guarding of trade secrets. This was during the area of the supremacy of the imported car, chauffeur and mechanic. In this connection many of the old time chauffeurs, who now, by the way, have come up through the ranks and are highly prized members of factory service personnel, will recall that, in the old days referred to, it was not unusual to see an imported artist performing such simple operations as grinding valves or adjusting "make and break" igniters, under the cover of a tarpaulin while the American chauffeurs, standing at a respectful distance heaped muttered epithets upon him, and envied him his expert knowledge.

That the foregoing is not overdrawn will be attested by at least a score of the "old timers" above mentioned.

A NEW ERA OPENING

Viewing this period in retrospect it is not difficult to recognize the motive of the survival of the fittest which governed the foreign mechanics. But that the same spirit should have persisted to the present and that a reflection of it is still to be found in the service policies of several universally known concerns is surprising and not to the best interests of the industry.

Recognizing the last point the National Automobile Dealers' Association is fostering a plan for the dissemination of information covering intimate details of latter day motor car design and construction which, not so long ago, were considered semi-confidential and not to be divulged to the common herd of service mechanics except as these were selected and trained in the service departments of the concerns.

The N. A. D. A., working on the theory that the man who is able to teach 1,000 men to do one job right performs a service many thousand times more valuable than as though he were restricted to the performing of the operation, has succeeded in securing the co-operation of the Continental Motors Corporation, the Timken-Detroit Axle Co. and the Borg & Beck Clutch Co. in a program of education aimed toward the bettering of service on the units produced by these respective concerns.

The educational campaign has taken the form of a series of informal talks—not lectures—given by the sales and service engineers of the co-operation

companies to all and sundry of the service mechanics of the cities fortunate enough to be included in the itinerary.

KEEN INTEREST SHOWN

Beginning May 10th, the talks have been given in Detroit, Indianapolis, St. Louis, Kansas City, Omaha, Chicago and Milwaukee. Announcement cards sent out to the dealers in these cities, extending a cordial invitation to their service personnel, have resulted in a splendid attendance at every one of the meetings. Those who came spurred by curiosity, quickly became intensely interested and, after the talks were finished, crowded about the instructors and cut-out sections of the working parts eagerly asking questions on the fine points of adjustments, their whys and wherefors.

Such queries were replied to in the most careful detail and none who attended but left much better qualified to render intelligent, owner-satisfying service on the products of the co-operating concerns. At the Chicago meeting, held in the Lexington Hotel, June 9th, 165 mechanics and service executives handed in their names on the registration cards, provided for the purpose, with the request that instructive matter on the parts and units be supplied them.

The Chicago Automobile Trade Association deserves much credit for the splendid showing as the "get together" spirit emanating from this organization succeeded in overcoming the apathy engendered by a heat wave which swept the city just at that time.

It is reported that the attendance was considerably better in the other cities mentioned.

SCOPE OF THE INSTRUCTIONS

The talks were given by Mr. Paul Lund, of the Continental company; Mr. H. E. Rotert, of the Timken-Detroit company, and Mr. C. M. Ahlne, of the Borg & Beck company. These gentlemen are so completely masters of their subjects that their talks are informal in the extreme, there being nothing of the cut and dried lecture about them. Mr. Lund explains such points as the proper clearances to be allowed in piston, ring, connecting rod, main bearing and timing gear fits, clearly and concisely together with the reasons therefor.

Mr. Rotert's instructions on the proper adjustment of Timken axles, both spiral bevel and worm drive, held the interest of his auditors from beginning to end.

He explains in detail why backing off the bevel pinion is not all there is to

be done in quieting a noisy axle and why, when one gear is replaced, its mate should also be installed. The Borg & Beck Clutch, as explained by Mr. Ahlne, becomes something more than an assembly of plates, friction disks and levers.

As its story unfolds during his able discourse, behind the finished product the years of thought and study which have made it possible are brought home to the listener's comprehension. When, therefore, Mr. Ahlne directs that the unit be adjusted in such a way that the normal straight line of the small levers is preserved and gives the clearly logical reason for such an adjustment, his words sink into the memory of his mechanic-auditors and fit them to do the job better when next the occasion arises.

ALL MANUFACTURERS INVITED

The Milwaukee engagement was the last for the summer. Beginning some time in the fall the work will be taken up again. It is expected that, by that time, other unit and parts manufacturers will have realized the value of the movement, viewed from the aspect of good business and self interest if not from the altruistic angle, and that they will have joined forces with the N. A. D. A. to the end that the service mechanic of tomorrow, through an intensive education on the "whys" as well as the "hows," shall be a several hundred per cent better workman than he is today.

WESTCOTT SALES IMPROVE

Springfield, O., June 9—At a conference held recently with E. H. Gilcrest, general sales manager for the Westcott Motor Car Co., the members of the sales force in attendance reported that general improvement in business conditions is noticed everywhere. The representatives who came to Springfield for the meetings were: B. M. Shofstall, of the eastern sales district; W. A. Hinchman, of the southern district; W. H. Nash, of the southeastern district; F. J. Farr, of the middle western district, and H. H. Griffith, of the western district.

A large number of distributors reported a tendency toward improvement in every case. Those who visited the plant were: A. W. Rowe and H. H. Brehm, of Chicago; Morris Weber, of Dayton; H. R. Beckenbach, of Cleveland; Charles McQuitty, of Oklahoma City, Okla.; J. L. Timmerman, of Buffalo; H. L. Dean, of Huntington, W. Va., and J. M. Jones, of Utica, New York.

Concerning Men You Know

Fred H. Williams, for the last seven years an executive in the home office of the White Co. in Cleveland, where he was in charge of the general sales department before being made vice president of the company, has been appointed general manager of the Philadelphia branch.

Roy E. Breeden has been named division sales manager of the Service Motor Truck Co. for Michigan and Northern Ohio; Walter Dix for Maryland, Virginia, North Carolina and part of Delaware; L. A. Poundstone for Pennsylvania and parts of New Jersey. Fred G. Whipple has been put in charge of Service sales in California, Arizona and Nevada.

Harry Starkie, Chevrolet dealer in New Britain, Conn., has resumed the representation for Hartford county, taking over the factory agency proposition which succeeded him in the local territory several months ago.

Fred J. Wood has been appointed service manager of the City Auto Repair Co., Hartford, Conn.

Langdon A. Smith has been appointed vice-president and director of sales for the American Motors Corp., Plainfield, N. J. The company has appointed D. M. Kingsley as manager of its New York branch.

F. M. Goodman, who has represented the Elgin Motor Car Corp. in the central states for the past five years has been appointed district manager of all eastern territory. Mr. Goodman's headquarters will be in New York City.

J. Henry Smith has been appointed vice president in charge of the motor parts division of the Rich Tool Co. and vice president of the

Sheet Steel Products Co. of Chicago with headquarters in that city.

Harry E. Geib has been appointed to the post of manager of the Chicago office of A. Schrader & Son, Inc. Mr. Geib has been given special training for his new position and is equipped to give efficient service to customers.

B. B. Doggett, Henrietta, N. C., has opened a sales room and garage here, handling Ford cars.

Joe J. Currin, of the Currin-Winbush Co., Winston-Salem, N. C., has disposed of his interest in that firm to J. H. Bowman and in the future will be connected with J. W. Wix & Son, local dealers for the Studebaker.

D. H. Crandall, Columbia, S. C., has bought the Coltrane Tire & Rubber Co., Inc., state distributor for the Hartford battery.

H. E. Doty has been appointed in charge of directing the sales and advertising of the Premier Motor Corp. of Indianapolis.

O. L. Weaver, connected with the Star Rubber Co., Akron, has resigned as sales manager effective June 1. He will continue as a director and secretary. A. G. Partridge, formerly vice president and general sales manager of the Firestone Tire & Rubber Co., will assume the office of vice president and sales manager.

Chas. W. Churchill, former general manager of the Winton Co. at Cleveland, has joined the general sales organization of the Buick Motor Co. at Flint. Churchill has been a director of the N. A. C. C. for a long time, and has been chairman of the membership committee and the patents committee.

Richard F. Lusse and J. Edwin R. Fox. It was decided not to hold any "sociability run" this year, as in the two preceding years and there will be no social function at least till fall. At that time it is considered probable that a ball will be given.

ST. LOUIS HEARS CHAMBERLAIN.

St. Louis, June 10—Between 300 and 400 members of dealer organizations in St. Louis have heard P. E. Chamberlain's lectures on "Selling Service Intelligently," "The Woman in White," and "The Flat Rate Method of Repairing," which have been given here during the past few weeks, in connection with Chamberlain's general lecture course on better service. Chamberlain conducted here a general class and also several special classes arranged for by individual dealer organizations. He has already delivered his lectures in several cities of the Southeast, in Ohio and Michigan and will go into other sections of the country later on.

Chamberlain has established headquarters at 320 North Grand Avenue with Paul F. Brophy, former executive secretary of the Carolinas Automotive Trade Association, as his personal representative.

NEW CAR FOR WEST COAST

Los Angeles, June 10—The West Coast Automobile Mfg. Co. has been organized under the laws of California with a capitalization of \$1,500,000 to manufacture a passenger car, truck, tractor and trailer. Its manufacturing plant will be centered at this city. The officers are Theo. F. Ruhland, president; W. Augustus King, first vice-president, general manager and designing engineer; Hargreaves Thompson, second vice-president and sales

manager, and Alexander N. Roberts, secretary and treasurer.

The passenger car which will be produced first will be known as the Mission Six and Mission Eight, the former equipped with the Continental motor, 3½x5¼ and the latter with an eight-in-line motor, 2½x5. The company which is entirely a west coast proposition proposes to distribute its product exclusively on the west coast.

Varnish Maker Is Charged With Unfair Competition

Washington, June 10—The Federal Trade Commission has cited the Beckwith-Chandler Co. of Newark, N. J., on allegations of unfair competition in the manufacture and sale of varnishes. It is alleged that the company, through its salesmen gives cash commission to foremen, finishers and other employees in automobile and carriage factories, without the knowledge of their employers, to induce them to recommend the purchase of Beckwith-Chandler varnishes to the exclusion of competitors.

The assertion is made that regular appropriations are made for these commissions and that they are charged to the cost of doing business, resulting in a higher price to the ultimate purchaser. Competitors assert they are forced to resort to the same practice or suffer loss of business. The company has been allowed 30 days to file an answer.

NO CHANGES IN SKELTON MOTORS

St. Louis, June 10—The Skelton Motors Corp. announces that no change in the ownership of the corporation has taken place and no successor to Dr. L. S. Skelton has been appointed. W. F. Traves, it is further announced, is in no way connected with the company and John A. Schroeder severed his connection with the corporation on April 14. The only acting officials of the company at this time are W. A. Chapman, vice-president and general manager, and Sidney Penniman, secretary and treasurer.

Dr. Skelton died Jan. 28 of this year and his interests in the corporation are being looked after by the administrators of his estate. Since then the company has been more or less in a state of reorganization. Plans are now being formulated at this time for the furtherance of the business.

HANDLEY KNIGHT NOT TO REDUCE

Kalamazoo, Mich., June 10—The Handley-Knight Co. has informed its distributors that it will make no further price reduction other than that announced last year before some time next year, if then. If prices, for some unforeseen reason, should be lowered this year the company will refund the full difference between the present price and any lower price that may be established and also guarantees to the dealer that in case of any such reduction it will equalize prices on any new unsold Handley-Knight cars in their hands or in the hands of their dealers.

North Carolina Starts on \$50,000,000 Road Program

Raleigh, June 10—North Carolina is off this week on its \$50,000,000 road program. Contracts have been let for roads in various sections of the state totaling nearly a million dollars. All these roads are links in the state system of highways and are mostly sections of main highways leading across the state.

Some of the contracts let this week were hard surface construction and some for top soil and gravel. It is the purpose, however, to hard surface the top soil roads later when they have settled down, it being the settled policy of the state to make all state highways hard-surface.

The state expects to spend something like ten million dollars this year in road construction, and a similar amount or more every year until the fifty million provided for is spent. In addition to this the counties are spending large sums on lateral roads, the total of this expenditure easily approximating as much as the state expenditure.

PHILADELPHIA GARAGEMEN ELECT

Philadelphia, June 10—The Philadelphia Garage Association held its annual election and smoker and George G. Blind, of the Mercury Garage, was re-elected president; Joseph Stern, of the Modern Garage, vice president, succeeding Isaiah A. Dionne, and John R. Fox was re-elected secretary and treasurer. Two new trustees were elected, to serve for one year, in place of William J. Bubeck and Murrell F. Dobbins, whose terms expired. They are Harry Ebert, of Ebert's Garage, and J. E. Groves of Grove's Garage. The remaining trustees are: Walter B. Jones, William M. Moser,

Better Business

Money-making Ideas

*A dollar will be paid for all ideas accepted as Better Business—
Perhaps you have some.*

Holidays Emphasize Need of a Car

Every holiday should be made a good selling point by the dealer. For instance, the Fourth of July can be utilized to splendid advantage in disposing of cars. And the way that it should be used is by inserting copy along the following lines in the local newspapers:

"AUTOMOBILE OWNERS WILL GET THE MOST ENJOYMENT OUT OF INDEPENDENCE DAY.

"Independence day to motorists means real independence—freedom to come and go as they wish. They don't have to be tied down to the hot city through inability to get out of town easily, comfortably and quickly. They can go to the lakes for the holiday if they desire, or take a run out into the country, or go on a fishing trip, or do anything they wish.

"You, too, will get more enjoyment out of Independence Day if you join the ranks of freedom by purchasing a car—NOW!

"Don't let this holiday pass without getting the most out of it. Let us sell you a good car now, before the holiday."

Uses Employees to Sell Lodge Members

An Indiana tire dealer has adopted a rather unique plan for boosting his sale of tires. He found that one of his employees belonged to the Moose lodge, that another belonged to the Elks while he, himself, belonged to the Chamber of Commerce and the Kiwanis club. So he has designated one day in the week as "Elks' Day" and on this day hangs out a sign stating that Mr. So-and-So, of his firm, is an Elk and that on this particular day of the week there will be special price reductions to all Elks purchasing tires. On another day he does the same thing for the Moose and on other days for the Chamber of Commerce and the Kiwanis club. In this way he has worked up a good business from the members of these four organizations.

School Graduates May Need Cars

After graduation from high school or college a number of young men will enter business for the first time this year. Some of these young men will enter vocations which call for the immediate use of cars if the young business men

are to get the most possible out of their business. Such vocations are medicine, real estate, etc. Since this is the case it would be a wise move for the alert dealer to get in touch with all the young graduates who are entering business.

This could be done by inquiring of the high school principals as to which graduates are going right into business from the high school and by watching the society columns of the local papers to note the names of college graduates. Most society columns, it might be stated here, run the names of all local college graduates at one time or another during the graduation weeks.

Advertises Daily Number of Cars Sold

C. L. Bornschein, distributor of the Paige cars in Allen county, Indiana, runs a regular advertisement in the Fort Wayne newspapers in which he states the number of new Paige cars in the county from day to day. The space used is one column wide and half-inch in depth. The ad reads like this: "198 Paige Cars in Allen county to date. Watch this number grow." Mr. Bornschein feels that this little advertisement is quite effective in making folks feel that he is an up and coming dealer.

Don't Forget Follow-Up Service

The Columbus Buick Co., of Columbus, O., has a plan for ascertaining the value of the service rendered to owners.

Several days after a repair or service job has been completed a return postal is mailed the owner containing the following:

Our records show that repair work on your Buick was completed at our Authorized Service Station June 12. We will thank you very kindly to fill out the attached card and return to our service manager.

*Were you pleased with the work?
Did you ask for any information you did not receive?
Did you receive courteous treatment?
State here any suggestions you can make which will improve Buick service.*

Places on the card are left for the name, address and phone numbers of the owner.

The Dealer Is More Than a Salesman

"This is more than a sales department," stated the Northern Indiana Motor Car Co., of Fort Wayne, Indiana, in a recent advertisement. The ad then went on to say: "You can buy an automobile anywhere, even on the sidewalks, but your satisfaction in the use of it depends upon the ability of the one who sells it to you to help you realize your expectations.

"That makes more than a sales department. We invite you to inspect those extensive parts of our establishment that exist to function only after the sale is made."

This seems to be a good point for other dealers to emphasize—the fact that there are parts of the establishment that exist to function only after the sale is made. Too many prospective purchasers have the idea that a dealer is a salesman only. They forget or overlook the service end of his establishment unless he emphasizes this phase of his plant.

A Humorous Idea for Selling Parts

A dealer, handling a popular priced car, cashed in on a joke that was familiar to most owners of the car. A display of parts was placed in the show window. Above was hung a large bundle of old baling wire. A card with the display read: WHEN YOUR RUN OUT OF BALING WIRE, REMEMBER THAT WE HANDLE GENUINE PARTS. Much attention and considerable amusement was attracted by the display, yet it brought home the fact that genuine parts could be obtained there.

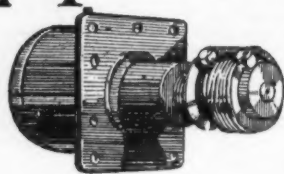
Making Use of Running Boards for Placards

One distributor always attaches a little placard to the running board of the cars he drives for the purpose of getting extra advertising for the cars. The placard reads like this:

"LITTLE SIX, \$1485 delivered. 20 miles to the gallon. Supply limited. See M. J. Smith, 1418 Main street, at once."

This same sort of a plan might be used by other distributors who are trying to get extra advertising for their cars.

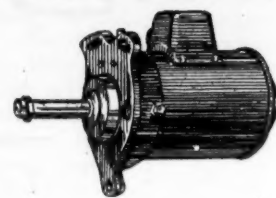
How the Electric System Works



Article X

By A. H. PACKER

Instructor, Ambu Engineering Institute



An Explanation of the Principle of Motor Car Ignition

A Short Series of Articles Wherein Is Given the Fundamentals Underlying the Operation of the Modern Electric System as Applied to Automotive Apparatus

THE week after I had given the Red Head his first lesson on ignition principles, I dropped in at the Fixit Garage and found him hard at work on an installation job, where an old ignition outfit which had served its time was being replaced by a new one.

The lad had followed the general ideas I had give him as well as he could, and seemed to have the wiring and timing both correct, yet, when he tried to start the engine it popped in the carbureter, spit and made an awful fuss but refused to run as a self respecting engine should. I took the distributor cap from the ignition unit and told him to give the crank a turn, so that I could see which way the ignition shaft turned.

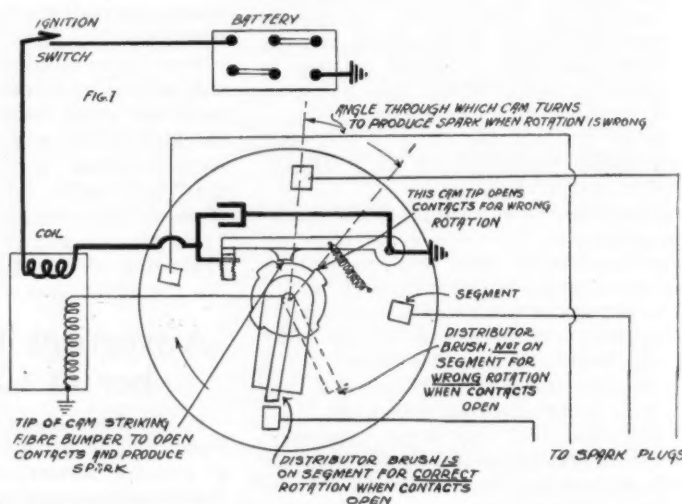
"What difference does that make?" asked the Red Head, "It gives good sparks, so it must be turning the right way." "Well," I replied, "You may be right and you may be wrong," but I am not going to figure it out for you." If you will take a look at this sketch a minute, I think you will see that it makes a whole lot of difference which way you run a battery ignition outfit, for if it works one way, it usually goes on a strike if you try to make it run the other way.

In Fig. 1 is shown an interrupter, with a four point cam operating against a fibre bumper on the interrupter arm, so as to break the battery circuit through the primary of the ignition coil, four times per revolution of the ignition shaft. The ignition shaft will then have to go half engine speed to suit a four cylinder four cycle engine.

In the interrupter is a condenser connected across the points to kill the arc, and the heavy lines show wires that carry current from battery to coil and through the interrupter to ground and back to battery. Mounted above the cam is a piece of insulating material usually made of bakelite, and set in this insulated arm is a metal piece known as the distributor brush.

When the cam opens the interrupter points and the condenser kills the arc at the points, the primary current through the coil is very suddenly stopped, causing the iron core of the coil to become suddenly demagnetized. This sudden change in the magnetic condition of the

Fig. 1—Showing distributor brush location in a battery ignition system for both the correct and wrong rotation



iron core produces a violent rise of voltage in the fine or secondary winding of the ignition coil, the insulated end of which is connected to this metal part or brush that is carried on the distributor arm.

In order to have proper operation of the ignition system and to be able to have this voltage produce a spark at the plug, it is necessary to have the distributor brush line up with some segment which is connected to a spark plug, at the same instant that the interrupter points open, and this is the condition that is indicated in Fig. 1 when the rotation is right hand or clockwise.

In the event that an interrupter distributor is driven left hand when the location of the distributor brush is correct for right hand, we have the condition in-

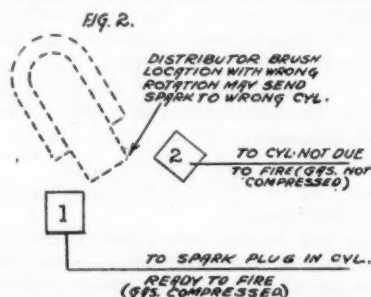


Fig. 2—Showing effect of wrong rotation on 8-cylinder unit or any type where segments are close together

indicated by the brush location shown by dotted lines. In order to open the interrupter points and produce a spark by turning left hand, the shaft would only have to turn about 30 deg., as indicated on the sketch, and the dotted distributor brush would then indicate its location.

The secondary voltage would then either be unable to send a spark, or if it did jump, it would probably jump the wrong way, either to ground or to the wrong cylinder, which is the condition with which the Red Head was struggling when I found him. If a condition of this kind is encountered on an eight cylinder job, the chances are strong that the spark will jump to the wrong cylinder, even when the timing seems O. K. for the error is not enough to be easily observed, and is only found by careful checking.

In Fig. 2 such a condition is indicated, where the distributor brush shown dotted is not quite on Segment No. 1 due to being run the wrong way. At first glance it might seem that the spark would still go to number one, but we must remember that the cylinder ready to fire has gas under compression so that it may be easier for the spark to jump the larger gap to number two and then jump the spark plug gap where there is no compression.

VIBRATOR COIL IGNITION

The type of ignition previously described is the one most frequently en-

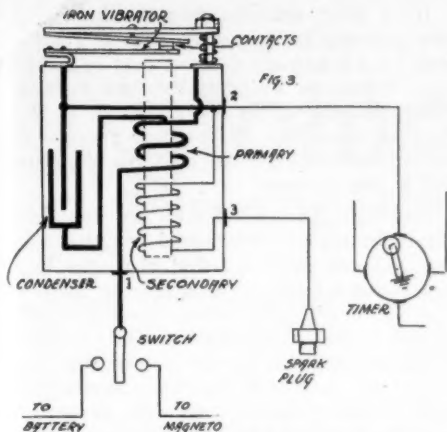


Fig. 3—Showing vibrator type ignition coil and general arrangement of wiring, this being the type of ignition used on Ford cars

countered, except that on the Ford car a type of ignition is used employing vibrating coils. Most mechanics think they know all about Fords including the ignition system, and this was the idea held by a couple of men who were receiving electrical instruction during the war.

When the government instructor tried to teach them something about Ford ignition they were quite insulted, so he handed them four pieces of yellow lamp cord and told them to time an engine. After trying for several hours they had to admit they were stuck for all along they had depended on the color scheme of the regular wiring, and when deprived of this method of checking they fell down completely, showing that they were working by memory and had no real understanding of the work they had been doing.

The internal circuits of a vibrator coil such as is used on Ford cars, as well as an indication of the external circuits are shown in Fig. 3. Current is used from either the battery or magneto, depending on which way the ignition switch is thrown, and goes to terminal "1" at the bottom of the coil. It then flows through the primary winding which is wound around the iron core, and then on to the upper contact of the vibrator, across to the lower point which is mounted on the iron vibrator, and then to terminal "2."

From terminal "2" a wire goes to a segment of the timer, in which a roller, rotating at camshaft speed grounds the segments one at a time, completing the circuit to battery or magneto. In the sketch the timer is shown connecting our coil to ground so that current would flow and magnetize the iron core. This would cause the iron vibrator to be drawn down, pulling the vibrator points apart, thus breaking the circuit.

With the break of the circuit the iron core would demagnetize allowing the spring action of the vibrator to again close the points and the above action would be repeated as long as the timer roller was on the segment. The condenser in the left side of the coil is shown connected across the contacts, so that a sudden stopping of the primary current, and hence a sudden demagnetizing of the iron core is possible.

This sudden change in magnetism sets up a high voltage in the secondary every time the points open, so that the continued vibrating action delivers a shower of sparks to the spark plug. When the timer roller goes to another segment, it allows another similar coil to work and deliver sparks to its plug, and so the action is repeated for each coil and each cylinder.

There is, therefore, a separate ignition system for each cylinder, except for the common use of the timer and source of current, which gives such a system the advantage that there is but slight chance of complete breakdown. With different vibrator adjustment in the different coils, there is however a variation in timing, which is not so likely to occur with the single coil system, and which may cause a somewhat irregular action in the engine.

SPARK PLUGS AND INTENSIFIERS

In Fig. 4 is shown a typical spark plug, this being a device used to carry the spark into the cylinder. The high tension wire from coil or distributor comes to the top of the plug and travels down the center wire or electrode, to jump the gap in the cylinder to the engine or ground, from whence it travels back to the secondary winding of the coil. Around the center electrode is an insulator, usually of porcelain or mica, which is used to prevent the spark jumping any place but at the spark gap in the cylinder.

Outside the insulator is a shell of steel in which the porcelain is held by a packing nut of some sort, soft gaskets being used to prevent breaking the insulator and also to seal against leakage of compression or explosion pressures. When a spark plug fails to fire, assuming that the ignition system itself is O. K., it is due to the spark finding an easier way to get from the electrode to ground than by jumping the gap in the cylinder, which due to being under compression, is the equivalent of about 3/16 in. out in the open air.

In the plug that we are considering there are shown three possible causes of misfiring, one being moisture or water on the upper part of the porcelain, which would allow the current to leak over the surface of the shell of the plug, water being a conductor for high voltage, although showing very little leakage with low voltage.

Another possibility, is the crack shown at the right side of the plug, and while the distance through the crack is greater than at the gap in the cylinder, the lack of compression at the crack, combined with a little dirt getting in, may make it easier for the spark to jump there.

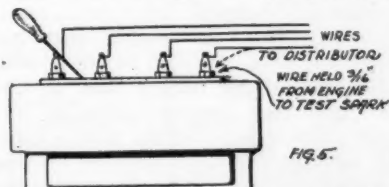


Fig. 5—Showing method of testing engine, spark plugs and action of sparks

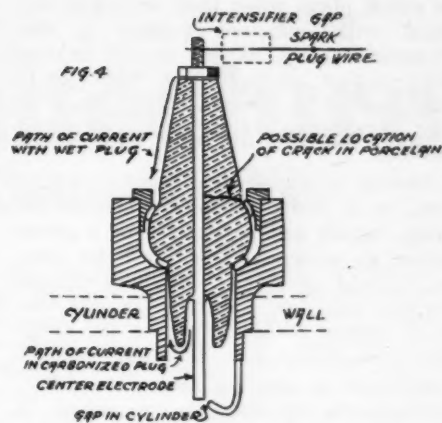


Fig. 4—Showing typical spark plug construction and the possible places spark may jump when plug is defective

This tendency will vary with different conditions of running, for at high engine speed, the cylinders do not have time to fill up with gas and the compression is less, so that the plug might operate properly, but might miss at slow speed and when pulling heavily, due to the wide open throttle and slow piston speed, which would make possible a high degree of compression in the cylinder.

Another cause of plugs misfiring, is a layer of soot or carbon deposit from burnt oil or gas on the surface of the porcelain inside of the cylinder, for carbon being a fair conductor, tends to carry the spark current from the center electrode over the surface of the insulator to the shell.

There is also a slight tendency for leakage straight through the porcelain, on plugs made of poor material, when subject to high temperatures, but this effect is probably negligible in most motor car engines, and when plugs fail to fire it is a 90 per cent safe bet that they are badly fouled with soot and oil.

In checking up to locate a cylinder that is not firing it is well to first check the ignition action itself as indicated at the right hand plug in Fig. 5. The dotted line and the arrow head indicate the regular wire removed from the plug while the engine is running, and held about 3/16 in. from the corner of the iron part of the spark plug, to see if the spark hits regularly and without a single miss.

With the engine running slowly it is possible to hear the snap of each spark and these should be checked until 50 or 60 sparks are heard to jump, without missing a shot. It is then safe to assume that the ignition system is doing its part, although it would be better to repeat the test on the other plugs as well.

If instead of hitting 50 or 60 shots without missing, it should miss every 8 or 10 sparks, it would be necessary to check over the coil, perhaps trying another one.

Also clean up the interrupter contacts, check the wiring for loose connections, and continue to hunt and substitute parts until the trouble was eliminated, as it would be useless to try

to check plugs when they were not supplied with sufficient voltage to fire. Trouble of this nature is the hardest kind to find, as no definite test can be used, and it is often a case of luck or else persistence when the cause is discovered.

Having obtained good sparks on this test, it is now possible to check the plugs, which can be done with a screw driver as shown at the left hand plug, for if held as shown, the high tension current will flow down the screwdriver blade instead of at the gap of the cylinder, thus killing this cylinder.

If there is now no noticeable difference in the running of the engine, it is evident that the engine had not been firing on that cylinder even before it was killed by the screw driver, and as fouled plugs are the usual cause of one cylinder missing, the bad plug is thus located.

It is, of course, possible that a sticking valve or other engine trouble is causing the cylinder to miss, and if this is suspected, it is well to reverse plugs with a cylinder that is apparently O. K. and if the missing goes along with the plug, it indicates plug trouble, but if it stays with the cylinder it indicates trouble in that cylinder.

With an 8 cylinder engine it is difficult to detect missing on but one plug, so that it is well to lay the high tension wires of one of the fours, say the right side, down on the engine so that the engine will run with the left cylinders only. It will then be easy to tell which plug is causing the trouble. In similar manner a 12 cylinder job can be run on six cylinders, and if desired three of these can be killed, to make it easier to detect trouble in the other three.

INTENSIFIERS

Spark intensifiers of which there are many makes being sold, are designed to assist a carbonized plug to fire in spite of its fouled condition. These contain a gap which usually is from $\frac{1}{16}$ -in. to $\frac{1}{8}$ -in. and are attached to the spark plug in such a way that the spark must jump both the intensifier gap and the regular gap in the cylinder, as these gaps are in series.

The nature of this connection is shown in Fig. 4, and the action is as follows: In order to jump the gap in the cylinder a voltage of about 5,000 is required, but before this value is reached, a carbonized plug begins to let current leak from the coil, which saps its strength and lowers its voltage to such an extent that a pressure of 5,000 volts may not be attained, in which case there is no spark at the plug gap.

The action of the gap in the intensifier, however, stops this preliminary leakage, because it disconnects the spark-plug wire from the carbonized plug. The high tension current is then dammed up until it finally breaks down the gap in the intensifier and the current comes with such a rush that it can not all leak through the soot and some must therefore jump the spark gap, enabling us to get a spark with a plug

that would not otherwise fire. With a clean plug there is obviously no advantage in using an intensifier.

TIMING THE ENGINE

To intelligently time an engine it is necessary to have a knowledge of the internal action, so we will now consider the events that occur in the motor car engine.

The four cycle engine is the type that is now used exclusively, but in this designation the word stroke has been left out, for the full term would be, the four stroke cycle engine, because it requires four strokes to complete its cycle or series of events. The four strokes are Intake, Compression, Firing and Exhaust, the first and third being obvi-

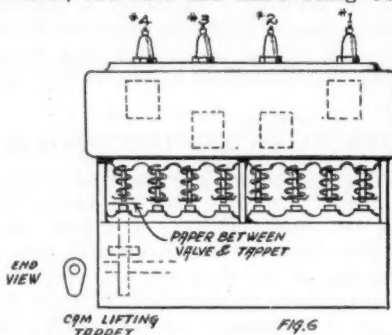


Fig. 6—Showing use of paper under No. 4 exhaust valve to check firing position of No. 1 cylinder. Correct position is obtained as paper just gets loose

ously down strokes of the piston and the others being up strokes.

As the piston goes down to draw in gas, the intake valve must, of course, be open, and it stays open until somewhat past bottom dead center to allow a full charge of gas to get into the cylinder. The intake valve then closes and the up stroke compresses the gas, in which condition it fires better and produces more power, just as a charge of gun powder gives a stronger explosion when tightly rammed.

At the top of the compression stroke the spark should occur, so that the gas will be fired and exert a force on the piston, to supply power to the engine, and somewhat before the bottom dead center is reached, the exhaust valve opens, in order that the remaining pressure may be relieved before the piston starts to come up as it blows the old gas out. At the top of the exhaust stroke the exhaust valve closes, and a few degrees later the intake valve opens, and the same cycle is repeated.

Now the timing proposition requires that we have the spark occur at the top dead center point, but as the engine makes two revolutions for each spark or power stroke, we must be careful to get the right top position.

In considering the action just described, we note that at one top dead position the spark occurs and at the other top dead center position the exhaust valve closes and the intake valve opens, so that the right time to fire the gas would be one revolution after the closing of the exhaust valve, or half a cycle late.

In a four cylinder engine there are two possible firing orders, that is 1 2 4 3 and 1 3 4 2 and we observe that in either case cylinders 1 and 4 fire one revolution or half a cycle apart, so that at the instant that No. 1 cylinder needs the spark, the exhaust valve of No. 4 cylinder is just closing.

Referring now to Fig. 6 we see that the cylinders are numbered beginning at the radiator, and we find that the last valve away from the radiator is usually the No. 4 exhaust valve. To tell when it just closes it is well to slide a piece of paper between the valve stem and the tappet or push rod, and then crank the engine over by hand, until the tappet is seen to rise and pinch the paper and lift the valve.

As we continue to crank the engine, one hand should be kept on the piece of paper, and at the instant that it JUST gets loose, the spark for the No. 1 cylinder should occur. In magnetos and most battery systems this will be the instant at which the interrupter points just begin to open, and in a Ford system using vibrating coils it will be the instant at which the timer just begins to make contact, which can most easily be determined by the use of batteries, and by then listening for the first buzz of the coil.

In six cylinder engines there are two common firing orders, as follows, 1 5 3 6 2 4 and 1 4 2 6 3 5 and in each of these it will be noticed that cylinders No. 1 and No. 6 are half a cycle apart just as No. 1 and No. 4 were half a cycle apart in the four cylinder engine. We can then use the same rule for the six cylinder engine as for the four, except that we look at the No. 6 exhaust valve which is still the last valve down the line, the one farthest from the radiator.

It sometimes happens that the valves are inaccessible as in a sleeve valve engine, in which case it is necessary to check by the compression, in order to get the proper top dead center position, and then to check the exact piston position by feeling with a piece of wire inserted at the spark plug opening.

If the firing order is not known it can be determined by the order in which the valves lift or by opening the pet cocks and putting wads of paper in them. If the engine is now cranked by hand, the wads will blow out in the same order in which the engine fires.

ARTICLE XI NEXT WEEK

ONEIDA STARTS PRODUCTION

Green Bay, Wis., June 13—The Oneida Motor Truck Co., of Green Bay, Wis., resumed operations on June 6 on a production schedule of 30 to 50 trucks per month, with a working force of about 60 per cent of the normal prior to the shutdown several months ago. Shortly after Jan. 1 it was found necessary because of business conditions to reduce the force 75 per cent or more. New business booked during the last six to eight weeks and orders for future delivery have enabled a resumption.

Automotive Architecture

Planning & Building Problems

Conducted by Tom Wilder

Guards for Spacing Cars

We illustrated a flatiron concrete form asked for by the Creek Motor Sales Co. of Milwaukee, Wis.

There is another type of guard which is preferred by many because it takes less material and is perhaps a more positive guard than the flatiron.

Instead of being under the car between the wheels it is placed between the cars, forming a sort of low wall at each side of the stall into which the car is backed.

Our illustration shows a plan view of three of these guards and an enlarged cross section through one of them. Here the car spacing is 6 ft. 6 in. and the width of the guard is 15 in. at the base. If the cars are given more liberal spacing, 7 ft. for example, the guard would be wider in this case 21 in. at the base. The width of the stall would always be the same, 5 ft. 3 in.

There is one objection to spacing the cars too closely when guards are used. The presence of the guards tend to make drivers careless in backing in; they depend more than they should on the guards, with the result that if a car has a very extensive overhanging at the rear, it is liable to hook a running board or front fender of the next car before it gets straightened into the stall.

As in the other case, 6 in. is a good height for these guards, but they may be higher in this case than in the other as with the exception of a few sport models where fenders extend very low there is nothing below the running boards to injure.

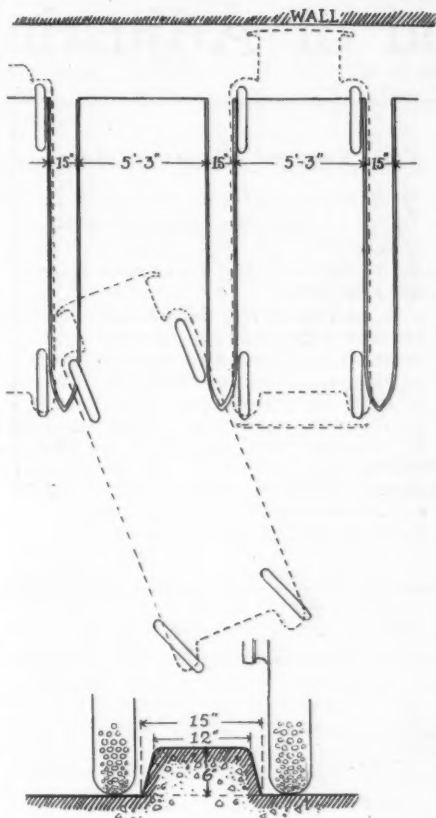
The slope of the sides should be such that spokes of wire wheels will not strike and the corners should be well rounded off so that tires will not be scored.

Layout for School of Motor Car Repairing

PLAN 346

We are planning to install a shop for teaching automobile repairing to our students and would like your assistance. The shop will be installed in a basement, the ceiling of which is 9 ft. and the room 22 by 37 ft. The south end will be entirely open to admit light and the north end will open out into a 7 ft. alley leading to the east end of the building. At the east end of the building we plan to erect a shed for housing automobiles while repairs are being made.

Only the parts to be repaired will be carried down through the alley to the shop on an overhead trolley. We expect to install the following machines: Universal burning-in machine, universal erector test stand, universal crankshaft straightening and testing device, universal axle stand, universal connecting rod alignment jig, one cylinder reboring machine, one screw cutting lathe, one power drill, one or two work benches and one motor stand.

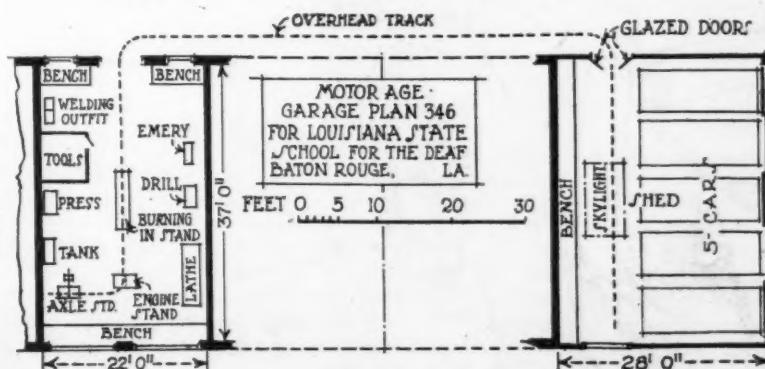


The guards as here shown are as close as it is possible to have them. At the bottom one is shown in section

—G. C. Huckaby, Supt. Louisiana State School for the Deaf, Baton Rouge, La.

This basement, unless it is a very high basement, does not look very desirable for a school room but we may be mistaken. It all depends on whether or not there is enough light. Men who are familiar with their work can get along with a limited amount of light but students who are uncertain, should be able to see what they are doing or trying to do in order to make the headway they should.

Plan 346—
Layout for
a shop suitable for student instruction in a technical course



If you construct your shed somewhat as shown, you will use a minimum amount of space and have very good working conditions. By building the whole side of sliding doors there is no interference in getting cars in and out and every inch of space can be utilized.

There is much work done on cars without removing any of the parts and you must have some space for this work. The 11 or 12 ft. strip in front of the cars serves very well for this purpose. If a rear axle is to be adjusted or removed, the car should be backed in so that it will be handy to the bench and working space.

Your selection of equipment is very complete with the exception of a weaver press or something similar, a small bench arbor and a cleaning tank. The latter may be home made. We suggest also that you train your students in acetylene welding since most first class shops are now equipped to do this work.

Automotive Architecture

In this department *MOTOR AGE* aims to assist its readers in their problems of planning, building and equipping, service stations, garages, dealers' establishments, shops, filling stations, and in fact any buildings necessary to automotive activity.

When making requests for assistance please see that we have all the data necessary to an intelligent handling of the job. Among other things we need such information as follows:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated, and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repair shop.

And how much of an accessory department is anticipated.

The Readers' Clearing House

Questions & Answers

Simple Method of Adjusting Headlights

Q—What are the more common forms of adjusting headlights?—H. R. Wecherle, Buffalo, N. Y.

Few of the many thousands of cars in service may be said to have their headlights properly focused to give the best light for country driving. In the cities the focus does not matter much, for in nearly all municipalities the authorities require either dimming of the headlights, anyway, or the use of side lights, but it is in the country, especially on dark nights, that the motorist wishes he had better light. So he stops the car, bends the lamps and brackets a little this way and a little that, screws the bulbs in or out, and attempts to produce a better illumination. He does not accomplish much for he has not gone about the job in a systematic, careful and accurate manner. You cannot properly focus the headlights and adjust them without measuring their light on a range.

The Proper Method

The best way to do this is to drive the car to a place where the lights can shine on a wall, and then adjust them so that each does its proper share of the illuminating in the proper way. Of course, the headlamps in different cars vary, and probably distances and dimensions which would properly focus the majority of headlamp installations might not do for every make of car. The best we can do here, however, is to give directions which ought to cover most cars which have lights of the usual size and reflecting possibilities.

The method given is that followed by

The Readers' Clearing House

THIS department is conducted to assist Dealers, Service Stations, Garagemen and their Mechanics in the solution of their repair and service problems.

In addressing this department readers are requested to give the firm name and address. Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been asked by someone else and these are answered by reference to previous issues. MOTOR AGE reserves the right to answer the query by personal letter or through these columns.

the Hudson company, and it covers the point in what seems to be the simplest way. Drive the car to a mark which is 40 feet from a wall, as shown in Fig. 1. Best results, will, of course, follow if the procedure is carried out in the dark. Throw the lights onto this wall, and adjust them so that the circle of light

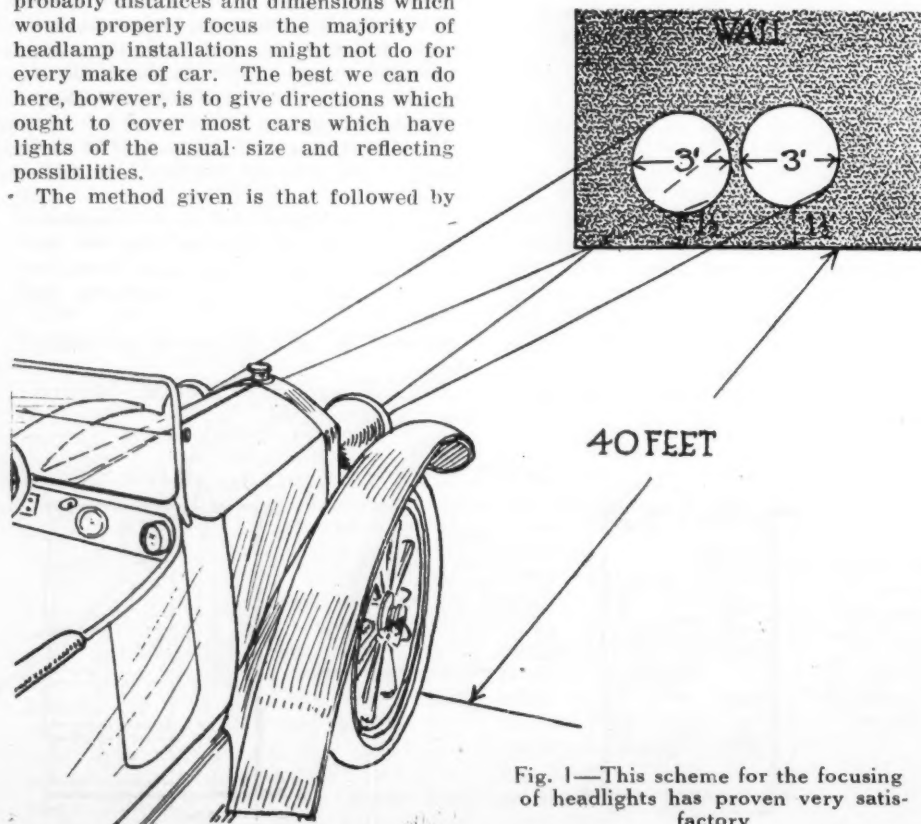


Fig. 1—This scheme for the focusing of headlights has proven very satisfactory

from each lamp will be about 3 feet in diameter, and the edges of these circles will just touch as shown. They should also be $1\frac{1}{2}$ feet from the ground at the lowest point of the circles.

This adjustment can be obtained both by bending the brackets slightly and by moving the bulbs either towards or away from the reflectors. There is a number of ways of doing this with different types of lamps, and the motorist undoubtedly has learned how to work them in his case. If the circle of light is too high or too low, bend the bracket up or down as the case may be; also bend it slightly to the left or right if the circles do not meet as they should.

CLUTCH DRAGS

Q—We are having trouble with a clutch which catches when engaged, making it very uncertain. Please explain how this trouble can be overcome. This is a Warner 6 plate dry disk clutch.—Shute Bros., Altoona, Pa.

We gather that the clutch does not disengage when the pedal is depressed. This is usually caused by wear and roughness of the parts upon which the discs slide. The remedy is to disassemble the unit and smooth away all roughness of the keyways or studs with a fine file and emery cloth. It is also possible that lubrication is required on all the moving parts with the exception of the disks.

CONVERTING OAKLAND FOR RACING

Q—What kind of ignition is best for speed, Delco or Bosch DU 4?

2—Are all Bosch DU 4 high tension?

3—Which is better for speed, set spark or variable?

4—Would you advise putting in Hudson Super Six valves or use the ones now in the engine?

5—How much would you recommend planing the cylinder head?

6—Explain how to time the ignition for speed.

7—Would advancing the valve timing kill my pick-up?

8—How fast should this car run tuned up by advancing valve timing, installing Bosch magneto and planing the cylinder head $\frac{1}{16}$ -in? This is a 1916 model Oakland, four-cylinder.—Ralph W. Creighton, Potomac, Ill.

1—MOTOR AGE never recommends any make of apparatus. Either will give you all the speed you can use on one mile dirt tracks.

2—Yes.

3—We would recommend variable for your purpose.

4—See No. 1. Any good quality valve

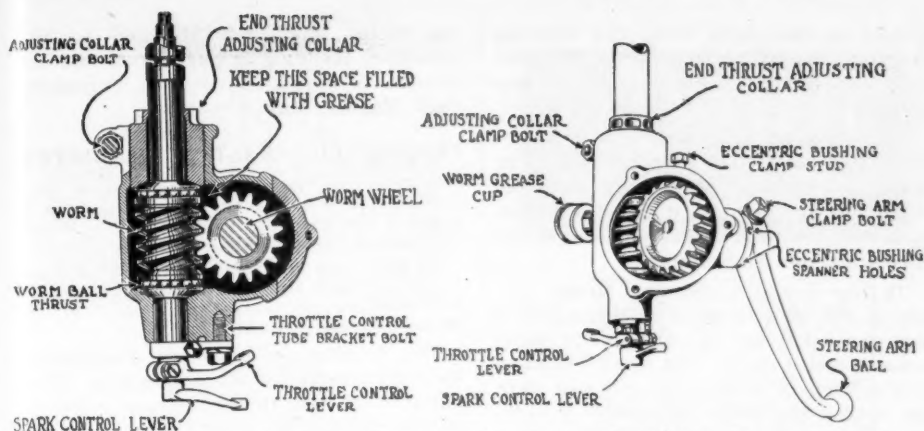


Fig. 2—Conventional worm type steering gear illustrating the irreversible principle

will prove satisfactory if it is correctly sealed.

5—We would recommend starting with a light cut, say about .025 and increasing it until the increased power desired is attained. Care must be exercised in this experiment as the shaft and bearings of this engine were designed to transmit a certain amount of power and if the original safety factor is exceeded to too great an extent failure of the parts is certain to result.

6—There is no set rule for this. If you use a variable timing you will have a change which will give you all the speed needed.

7—No, not unless carried too far. An advance one tooth will be found to be about all that is practicable.

8—This is impossible to answer positively. Our estimate, about 70 to 80 m. p. h. is no better or worse than you may receive from other authorities. The only way to find out positively is to try.

STEERING GEARS

Explain the mechanism of the non-reversible worm and gear. Publish a clear diagram showing why it is non-reversible. —H. C. Huff, San Quentin, Calif.

Fig. 2 shows a conventional type of irreversible worm and gear steering gear. The term irreversible is relative only. The easiest way to comprehend why the gear is, practically, irreversible is to picture in the mind a similar device having a very large gear, say one 2 ft. in diameter. Now imagine this gear being turned. It is at once apparent that the contour of the gear and worm tooth would cut very little figure in this case and that the tendency would be for the device to act like a spur cut gear and rack. That is to say that, instead of imparting a turning movement to the worm, the gear would simply exert a force parallel to the worm axis. Such a mind picture is, of course, exaggerated. However, it illustrates the principle perfectly.

ELECTRICAL SYSTEMS

RIGHT AND LEFT HAND RULE

Q—Advise how to use Mr. Parker's right and left hand rule applying to motors and generators. Can't figure which way to hold my hand in accordance with his illustrations.—Roy Ide, Outlook, Wash.

The right hand rule is used to determine the direction of the magnetic lines of force surrounding a conductor. Imagine a conductor with current flowing from right to left. If it is grasped with the thumb pointing in the direction of flow, toward the left, the fingers will be pointing in the direction of the magnetic lines of force which are whirling around the outside of the wire.

You have probably confused electricity with magnetism and have gained the impression that the magnetism flows lengthwise of the wire. This is not the case. It is really as though the electricity flowing through the wire created a sheath of magnetism for its full length. Or, consider that the insulation of the wire is permeated with magnetism and you will have a very good mind picture of the idea. Another very good right hand rule determines the polarity of an electro magnet when the direction of current flow is known.

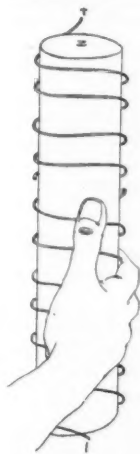


Fig. 3—An example of the right hand rule to determine the polarity of an electro-magnet. The thumb is pointing to the north pole

This is illustrated in Fig. 3. Grasp the coil with the right hand in such a way that the fingers point in the direction of the current flow. The thumb will point toward the north pole. In the illustration the current is pictured as flowing from left to right around the iron core. Applying the rule it becomes apparent that the left end of the core is of north polarity.

The left hand rule is a trifle more difficult to understand for the reason that three factors enter into the consideration. The best way to work out the correct pointing of the fingers is to extend the left arm straight in front with the fist doubled. Now unfold the thumb until it points straight across the body to the right. Next unfold the first finger until it points straight ahead. With the second finger unfolded so as to point straight down the gesture is complete. It will now be seen that the three members point at right angles to each other. With a clear understanding of how to point the fingers the determining of motor rotation, as explained in the May 5 issue of this magazine, should be easy.

LIGHT WIRING FOR OLD CAR

Q—Can you supply me with a diagram and plans showing how to wire a Pierce-Arrow 1912, 6-38 model limousine?

Fig. 4 shows a simple wiring scheme which any one of average mechanical ability should be able to follow out successfully. A 6-volt 9 or 11 plate lighting battery will be satisfactory as will any of several makes of gang switches to be had at the automobile supply houses. What is known as a four gang, single wire switch will be required. The wire should be of not less than 14 gage and of the best quality procurable. This may also be purchased at the supply houses. It will be noted that the instrument and tail light are wired in series. This is done so that the instrument light will act as a pilot for the tail light. Should the latter go out the former will also become extinguished thus giving the driver warning. The head and dome lights will require 6-8 volt, single contact bulbs. The instrument fitting and bulb must be of the double contact type of a 3-4 volt rating while the tail light will need to be of the single contact variety rated at 3-4 volts.

BIJUR GENERATOR REGULATION

Q—We have a 1917 Packard generator and it seems impossible to regulate the charging rate. It throws 30 amperes at a speed of 8 m. p. h. and if we cut the charge down with the adjustment the points will not close at a speed of less than 30 m. p. h. Can you give instructions on how to overcome this?—F. W. Kelly, Adair, Iowa.

This is a constant voltage regulation system, meaning that the voltage is constant while the current output varies with the state of charge of the battery. In theory it is quite excellent but owing to the more rugged construction of the third brush, constant current apparatus these have superseded the somewhat more complicated constant voltage machines. We are of the opinion that your trouble is due to a short circuit in the resistance coils which have the function of limiting the amount of current which passes to the generator field windings. This can be tested by disconnecting the unit and using several feet of iron wire in its place. Common hay bale wire will do very well. Starting with a length of about 10 ft. gradually shorten it until the current output is not in excess of 15 amp. at an engine speed which corresponds to a car speed of 30 m. p. h.

Should the trouble be found to be that suggested it will be easy to have another resistance unit rewound, or to procure one from the manufacturers. The latter course is preferable. The diagram shown in Fig. 5 should be of assistance.

BRISCOE WIRING

Q—Publish wiring diagram of 1920, Model 4-34 Briscoe.—Leonard Balletto, Chicago, Ill.

See Fig. 6.

STARTER SWITCH CUTS OUT IGNITION

Q—What cause the ignition on a Model 90 Overland to cut out when the starting pedal is depressed. The firing has been checked and the battery is O. K.—J. C. Brown, Hastings, Mich.

This is such an interesting question that it has drawn several suggestions from contributors all over the country. Some suggest that it is caused by a

ground in the cable from the starting switch to the starting motor. This was suggested in our previous reply to this query.

The following contribution will doubtless throw some light on the matter. The cause herein assigned is quite plausible as getting connections reversed is a comparatively common occurrence. Fig. 11 illustrates both suggestions.

"In the Reader's Clearing House section of the May 12 issue of Motor AGE I read the following question. (The question as printed above.—Ed.) An Overland 90 was brought to our garage a few days ago having the same difficulty. A careful examination of the wiring revealed the fact that the negative cable from the battery had been attached to the insulated terminal of the starter instead of the grounded terminal and the cable connecting the starting switch to the start-

ing motor had been attached to the grounded terminal instead of to the insulated terminal.—Arthur L. Campbell, Park Rapids, Minn.

IMPROVISED "MASTER" VIBRATOR

Q—Can the Delco coil used on a 1914 B-25 Buick (ignition relay) be used as a master vibrator for a Ford car? If so, how should it be wired.

2—How can dry cells be used in conjunction with a high tension magneto for starting or emergency use?—H. P. Mehn, Hueneme, Calif.

Fig. 10 shows a schematic diagram of the connections for the adaptation. Terminal 3 of the Delco ignition relay is to be disregarded. How well this arrangement will work we cannot say as we have no data available on the resistance of the relay coil or the capacity of the condenser. However it will not cost anything to try.

2—This cannot be done except with those magnetos which are equipped with commutators to reverse the direction of the battery current through the armature winding. Some of the older Bosch and Simms magnetos were so equipped.

STUDEBAKER SWITCH CONNECTIONS

Q—Publish internal drawing of the 1915 Studebaker 4 lighting and ignition switch.—C. T. Thompson, Dodge City, Kansas.

The top view in Fig. 9 shows the inside of the switch. This will, probably, serve your purpose better than would a diagram. The bottom view shows the back side of the switch with the correct connections. This is, of course, reversed in relation to the top view. Clipping them out and pasting them back to back will give a splendid working guide.

LAP WOUND ARMATURE

Q—Have rewound the armature on a Wagner electric generator, -6 volts, Spec. E. M. 107, "Four Pole Field Magnets." Would like some information as to connecting the commutator. There are 21 slots on the armature, four coils per slot. There are only 83 bars in the commutator and four brushes, two field and two armature. Are these armatures wave or lap wound?—Chas. F. Milner, Owatonna, Minn.

Specific instructions on the winding and connections of this armature would be too lengthy to be printed here. Suffice it to say that it is lap wound and that the connections must be made in accordance with the rules governing lap windings. Simplified diagrams of lap windings for four pole apparatus are shown in Figs. 7 and 8.

MISCELLANEOUS

RACING CAR DATA

Q—What is the road clearance, wheelbase, length of front and rear spring of most racing cars?

2—What spring suspension is most suitable?

3—What is the usual gear ratio?

4—What is the bore and stroke of a four-cylinder racing motor?

5—Should I use a Hall Scott aviation motor, four-cylinder, model A7A? Would the results be satisfactory?

6—What is the bore and stroke of the Frontenac?—J. M. Ragagli, Chicago, Ill.

A Simple Wiring System

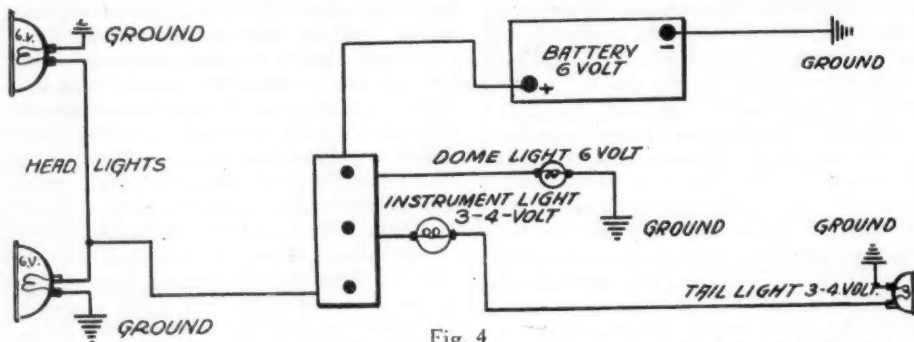


Fig. 4

Wiring of Bijur Internal Circuits

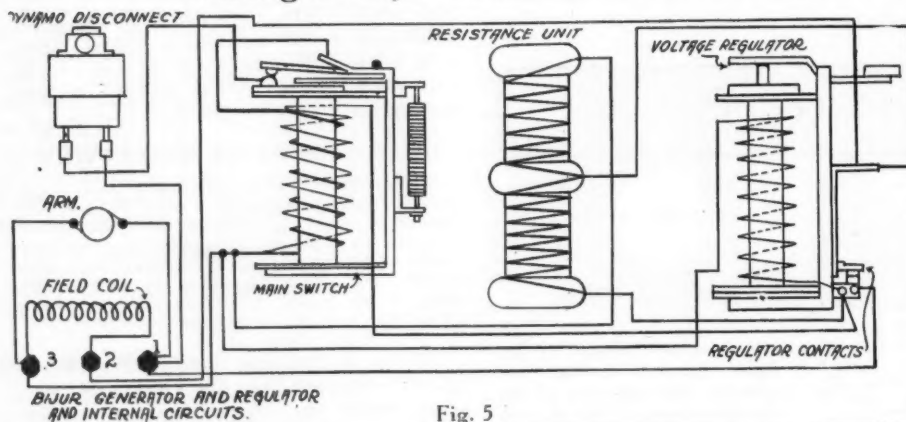


Fig. 5

Wiring of 1920 Briscoe, Model 4-34

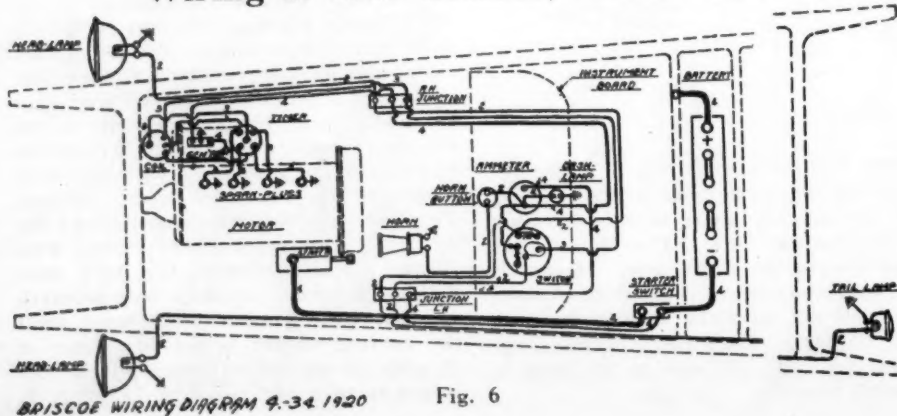


Fig. 6

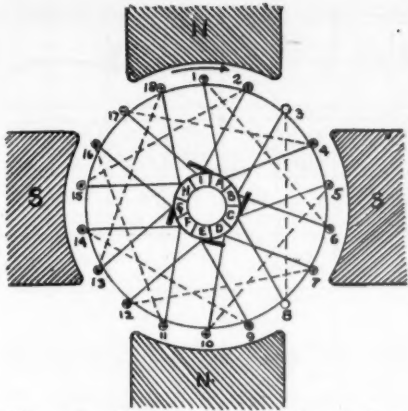


Fig. 7—Commutator end of lap-wound armature

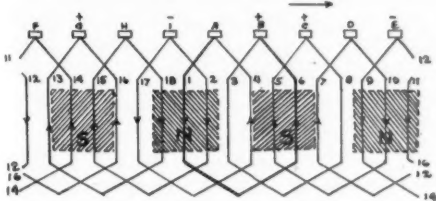


Fig. 8—Development of a typical lap winding

1—Complete specifications of the cars in the last Indianapolis race will be published in an early issue of this magazine. The length of the springs is optional with the drivers. They vary.

2—Semi-elliptic.

3—See No. 1.

4—See No. 1. Any dimension that will come within the A. A. A. limit of 183 cu. in. total piston displacement.

5—Yes, if you can build a chassis sturdy enough to stand the strain. This is a very powerful engine having a bore and stroke of $5\frac{1}{2}$ by 7 inches. Naturally it will not come within the A. A. A. limit.

6—See No. 1.

INCORRECT CAR DATA

Q—Advise the generator output of the Bijur generator employed on the Scripps-Booth model C at 10, 15, 20 and 40 m.p.h. At 20 m.p.h. the ammeter shows a charge of about 10 amperes and at 40 to 45 m.p.h. the reading drops back to about 5 amp. discharge. What is the trouble and how can it be remedied?

2—Publish wiring diagram of the 1919 Winton Model 33.—Philip Baker, Pittsburgh, Pa.

Both of your inquiries are too vague for us to formulate an accurate reply. For instance there have been two model

C Scripps-Booth cars—1916, 1917, and three model 33 Wintons—1916, 1917, 1918. To avoid just such chances of error we are now requesting that inquirers favor us with the serial numbers of the cars upon which they desire information instead of calling for it by model code designation.

The serial number is always stamped somewhere on the engine, or other of the permanent metal parts of the car and is, therefore, always available while the model code letters or figures are many times simply stamped into a metal tag or name plate which is easily removed and lost. If you will favor us with the serial numbers of the cars in question we will be most pleased to assist you in any way possible.

The falling off in current mentioned is sometimes caused by a high segment in the commutator which causes the brushes to vibrate and jump when the engine is turning over at high speed. However it is somewhat unusual for a heavy discharge to take place. Perhaps it would be well to check your ammeter with a known correct instrument.

FRANKLIN, 1912, ENGINE

Q—What size engines were used in the Franklin four-cylinder cars built in 1912? About what gasoline mileage will a car of this model make under favorable condi-

tions? What changes would be necessary before this car would burn present day fuel successfully?

2—About what speed should this car make under favorable conditions?—Robert H. Johnson, Oakland City, Ind.

1—There were two models of Franklin cars built in 1912. One of these was equipped with an engine 3.38 by 3 in. and the other with one 4 by 4 in. It is quite possible that with a thorough "tuning up" the car will operate fairly satisfactorily on the original carburetor and manifold. It is worth trying at any rate. If it is not completely satisfactory possibly shortening up the manifold and installing a carburetor especially designed for the heavy fuels will better the performance. We should say that the gasoline consumption would be in the neighborhood of about 15 to 18 miles to the gallon.

2—This is very difficult to say. Probably between 45 and 50 m. p. h.

INSTALLING LIGHT PISTONS

Q—Would it be practicable to install a set of light cast iron pistons on a model 34-B 1918 Oakland? If so, where could I purchase same?—Jesse R. Hunnal, Runnells, Iowa.

1—This should be entirely practicable. Success will depend not nearly so much upon the brand of pistons used as upon the skill with which they and the rings are fitted.

2—The names of several manufacturers of high quality pistons will be found in our advertising columns. Any of the following will supply you with dependable merchandise. Clark Turner Piston Co., 1240 Los Angeles St., Los Angeles, Calif. Cochran Piston Corp., Detroit, Mich. The Trindle Co., 2917 So. Wabash Ave., Chicago, Ill.

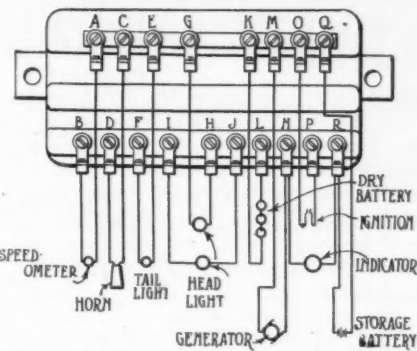
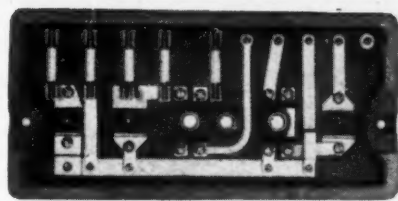


Fig. 9—Rear and front views of Studebaker 1915 switch

Delco Ignition Relay Used as a Master Vibrator

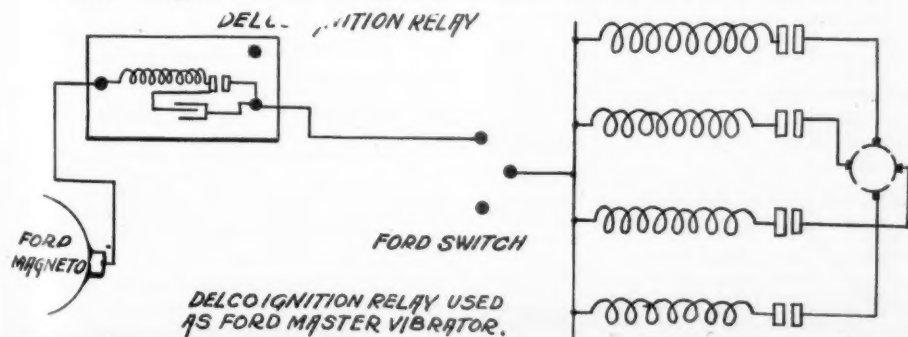


Fig. 10—Suggested adaptation of a Delco ignition relay as a Ford master vibrator

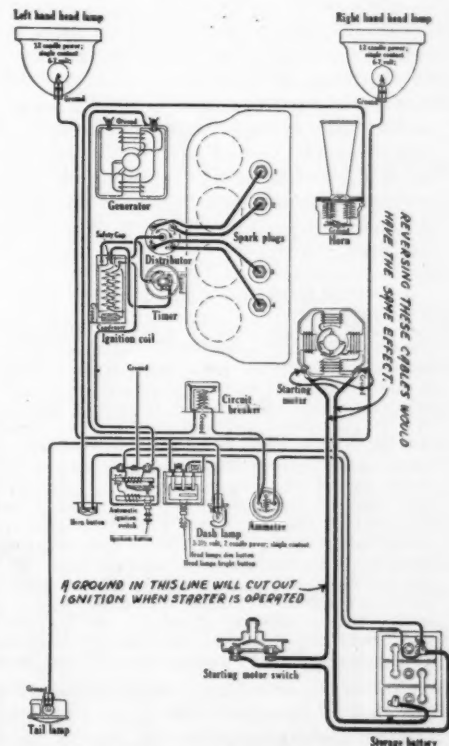


Fig. 11—Wiring of Overland 90. A ground in or reversal of the negative battery cable would cut out the ignition when the starter is operated

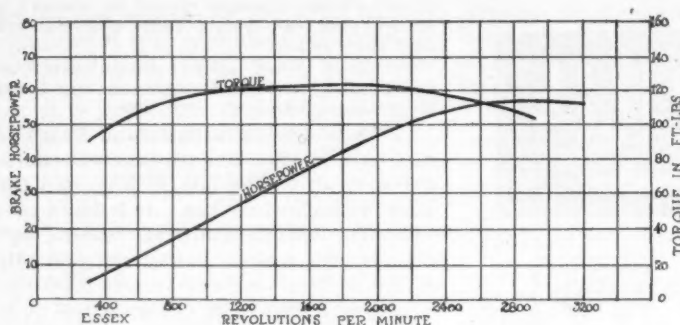


Fig. 12—Power curve of Essex

POPULAR POWER ENGINE CURVES

Q—Publish power curves of the Studebaker, E. J. Light Six, 1921 Dodge, 1921, Sept. 25, '19 Buick and the Essex.—R. J. Downer, Hopkinsville, Ky.

Power curves of Studebaker, Dodge and Essex are shown in Figs. 13, 14, and 12, respectively. As you fail to mention the model Buick on which you desire information we regret that we cannot serve you in this particular.

ENGINE FAILS AT HIGH SPEED

Q—In our older models N and R Hupmobiles, we have had trouble with these engines cutting out at high speeds. Our compression is good and the carbureter is set correctly. The only thing we can now lay this trouble on would be the ignition. This we have fully tested by using new governors on the open circuit unispart, and new points on both types. These parts were received from the Atwater Kent Co., and are parts used by them. We have tried this out with new coils and relays but with no success. Can you offer any suggestion?—Western Motors Co., San Angelo, Texas.

Without more complete data on this peculiar problem we would not attempt to hazard a guess. There surely must be some other indications which would enable us to arrive at a plausible explanation or, at least, formulate a theory. For instance, is there any shooting back through the carbureter? Does disconnecting the exhaust manifold help any? Has removing one of the plug wires and watching the passing of the spark been tried? Upon receipt of more complete information we will be glad to go into this matter further.

CLOGGED RADIATOR

Q—Advise the best manner in which to clean the rust from the radiator of a car. The radiator has such a heavy deposit of rust that when the car is run over 25 m.p.h., the water is forced out of the drain pipe instead of going down through the radiator and this loss of water also causes the engine to overheat. Have heard that soda is good to remove the rust from a radiator. In just what quantities should soda be used and is there any danger of the soda eating through the radiator? Am certain that the overheating is caused by the radiator being clogged because it takes quite a while for a gallon of water to go into the radiator. This car is a Hudson Super-Six.—Robert Leuschner, Waco, Tex.

There are two fairly good treatments for the removal of rust from radiators and circulation systems. In one of these a strong solution of washing (not baking) soda is used. Air is prevented from going through the radiator by covering it with a sheet of paper. The engine is

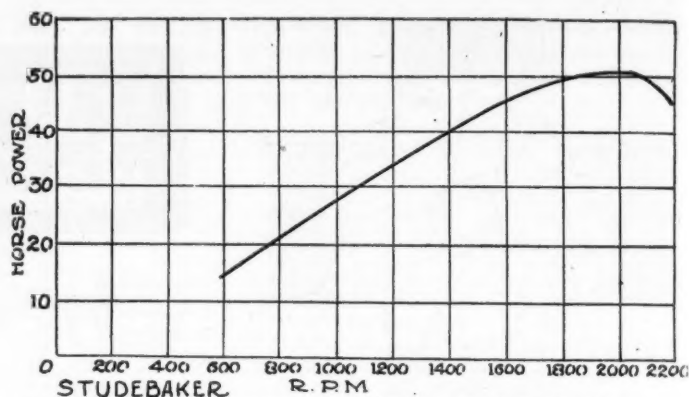


Fig. 13—Power curve of Studebaker E. J. Light Six

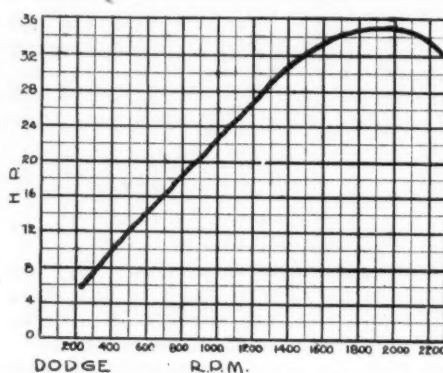


Fig. 14—Power curve of 1921 Dodge

run until the water boils quite violently. It is surprising how much matter this will clean out.

The other method uses kerosene and is somewhat risky on account of the liability of the vapor to ignite. The first method often discloses leaks in the radiator as it removes the plugs of rust which have kept these closed. On the other hand the kerosene has a tendency to disintegrate the hose connections. Perhaps of the two evils the latter is to be preferred but, on the other hand, if there are weak spots in the radiator it is well to know it and have them repaired.

ENGINE RATING COMPARISONS

Q—Publish power curve of the H. C. S. Special.

2—Publish power curve of the model 50 Haynes.

3—What is the weight and gear ratio of the H. C. S. Special and the Model 50 Haynes?

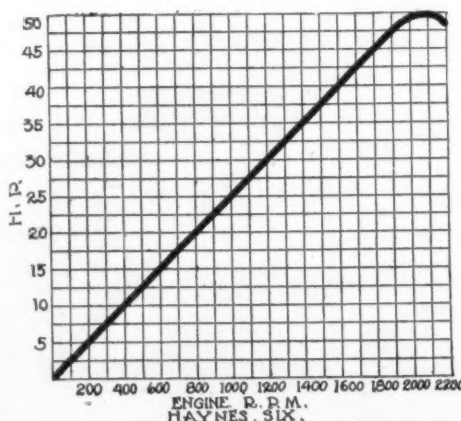


Fig. 15—Power curve of Haynes 50

4—What speed should they develop?—Jas. H. Boyn, Alliance, Nebr.

1—We have no power curve of the H. C. S. Special available. The rating is 58 hp. at 2,600 r.p.m.

2—Haynes 50 power curve is shown in Fig. 15.

3—H. C. S. Special: Weight, 3,300 lb. Gear ratio, 4 to 1. Haynes 50: Weight 3,200 lb. Gear ratio, 4.1 to 1.

4—A claim of 65 m.p.h. is made for the H. C. S. and 70 m.p.h. for the Haynes.

CARBURETER SUBSTITUTION

Q—Can a Ball & Ball carbureter, as used on a Studebaker Big Six, 1921 model be installed on a Studebaker 6-50, 1916 model? If so, advise adjustment. Could a Tillotson carbureter be installed on this car?—Henry Boswonkle, Loreburn, Sask.

We know of no reason why the contemplated change cannot be made. There can be no hard and fast rules covering the adjustment of the device to your engine. This for the reason that, owing to the natural wear of the parts in an engine of this age it is quite likely that the ideal setting, such as would be used with a new engine, would not prove entirely satisfactory. We suggest that you communicate with the manufacturers of the device, the Penberthy Injector Co., of Detroit, Mich., asking their opinion and advice.

DIRT TRACK GEAR RATIO

Do you think it advisable to lock the differential on a racing car to be used on a half-mile dirt track?

2—What gear ratio would you advise to be used on this car, equipped with (4½:1) Duesenberg 4½ by 6 engine, using 32 by 4-in. wheels for half-mile flat dirt track?—F. E. Weaver, Raleigh, N. Car.

1—No.

2—A ratio of 4½ to 1 should give a speed of something in excess of 60 miles per hour.

WORN TIMER

Q—What causes the Ford timer shells and rollers to become corrugated and how can this be remedied?

2—Understand there is a timer roller with a flange on the market which is placed in an old second-hand shell and it gives you a dual contact. Kindly advise where to obtain same.—H. Frankl, Chicago, Ill.

Wear. Your description is not sufficiently clear.

2—If you can favor us with a rough sketch of what you have in mind we will try to be of more definite service.

IN THE JOB PAINT SHOP

Removing Paint

1—Kindly publish necessary instructions for repainting automobiles.

2—How can old paint be removed from a car and what kind of a brush should be used?—Holsopple Bros., Hooversville, Pa.

If you will read the articles on pages 42 and 43 of the March 17 issue of MOTOR AGE, no doubt you will find something of interest. There are some different operations involved in automobile painting, and a dozen or more types of jobs that can be used in repainting, so you can see that a specific answer to your question would be impossible here in the space allowed. Advise that you learn the work in a first class shop, or take a course of instruction.

PAINT REMOVERS

Paint removers act by softening paint to a degree that it can be scraped off. There are many good ones to be readily had on the market, but the following formulae will give you an idea as to how they can be made in your shop, if necessary:

1—Acetone 30 per cent and alcohol 70 per cent with sufficient paraffine added to give the mixture body, so that when brushed on the painted surface it will not run off. This can also be made up in paste form with powered lye, and in that case the paraffine would not be used.

2— $\frac{1}{4}$ -lb. of paraffine or wax, $\frac{1}{2}$ -oz. of nitric acid, half cake of laundry soap, 2 gals. of benzol and 1 gal. wood alcohol, makes a very good paint remover, and in sufficient quantity to remove the paint from several cars.

BURNING OFF WITH PAINT REMOVER

The oldest method of removing paint from wood or metal is the one from which this operation gets its name. Hot irons were originally used, and one workman applied the iron while another one scraped off the paint. This method gave way to the gasoline torch, which can be held in one hand over the painted surface, while the paint is scraped off with a putty knife held with the other hand.

But when the metal body came into use, it was found that the heat of the torch warped the metal panels, and made them unsuitable for fine finishing; so liquid paint removers were adopted, but still the operation of removing paint with them is referred to as "burning off." They are now preferred for burning off because they can be quickly applied with a brush, and the softened paint scraped off with the knife. On account of its texture wallboard cannot be satisfactorily burned off.

TO BURN OFF A WOOD OR METAL SURFACE WITH PAINT REMOVER

Pour a quantity into a cup or can, and with an old worn out or cheap brush, apply it in generous quantities to the surfaces that are to be burned off—allow to soak in, and then apply another coat of it, and repeat until the paint coats are

soft enough to be easily scraped off with the putty knife. After scraping the surfaces as clean as possible with the knife, apply another coat of paint remover and go over them with a wire brush, scouring well and making sure that all of the old paint has been removed from the corners and cracks.

Then wash off with gasoline—applying it with a gasoline brush—and while the surface is wet with it scour well with steel wool. Then wash again with clean gasoline, and wipe off with clean rags. This cleaning with gasoline that follows the use of the paint remover must be very thoroughly done, for if any of it remains on the surface it will damage the coats that are applied over it.

Burn off the body first, protecting the running boards, and tires if left on, as previously shown; then burn off the chassis, starting at either the front or rear end; and arrange the stripped parts on a suitable bench or table for burning off. If the paint does not soften enough to be scraped off of some parts, it is a baked-on enamel.

BURNING OFF STRIPPED PARTS IN VAT

The quickest way of removing paint or baked-on enamel from any of the stripped parts not made of aluminum is by immersing them in a vat containing a strong solution of sal soda and water—or any other one of the alkaline compounds that can be had on the market for this purpose. Such a vat can be made of $\frac{1}{8}$ -in. sheet iron, shaped and riveted into a tank or vat about 8 ft. long, 4 ft. wide and 3 ft. deep.

Any boiler shop can make one for you, and it will well repay the expense in time and labor saved. The solution once made up will do for quite a number of cars. The parts are simply laid in the vat with the solution covering them, and allowed to remain there until the paint coats have dissolved. The paint, if not baked on, will come off quickly.

If baked on, it will take all the way from one to three days to remove it in a cold solution of sal soda; if a steam coil is run through the vat, or the solution otherwise heated, the same results can be gained in from five to eight hours. After removing the paint from the parts in this way, they should be well scoured with hot water, in order to free their surfaces from any of the alkaline solution, and allowed to dry. If the radiator on the car has a shell or outer casing, you can remove it from the radiator, and burn off in the vat along with the other stripped parts.

BURNING OFF WITH A GASOLINE TORCH

Prior to the arrival of metal bodies it was customary to burn the paint from wooden bodies with a gasoline torch, that is the paint was softened with the flame, and then scraped off with the knife. After the adoption of paint re-

movers for metal bodies, some shops still preferred burning off wooden bodies with a torch, because of there being less likelihood of the wood's becoming saturated with the paint remover, and later damaging the new paint coats—such was their belief.

The torch is still used in some shops for burning off wooden bodies, but it may be safely said that if the wood is well scoured with gasoline after the burning off with paint remover, and then allowed sufficient time for drying out, there should be no bad after effects.

In the burning off with a torch the flame is directed over one spot until the paint softens, and it is then scraped off with the knife. The hand holding the knife must follow the flame closely, and lift the paint just as it begins to blister from the heat. The work is tedious, and there is always the necessity of protecting the upholstery of open cars and the windows of the closed ones. Sometimes the wood is accidentally burned, and this spot must be well scraped out and cleaned before priming, and later puttied.

Sand Blast Machines

Kindly publish the names of a few concerns manufacturing sand blast machines for removing paint from cars previous to repainting. Also information concerning compressed air sprayers for painting automobile radiators would be appreciated. —Garage Americano, Havana, Cuba.

Sand blast outfit can be had from either of the following concerns: Pangborn Corp., Hagerstown, Md., or Mott Sand Blast Mfg. Co., 24 S. Clinton street, Chicago. Spraying outfits can be had from: De Vilbiss Mfg. Co., Toledo, Ohio, and Paasche Air Brush Co., Chicago. If you contemplate the installation of a sand blast for removing paint from the bodies of automobiles, it might be well to tell you that several of the larger shops here have tried out such a method and given it up as impractical. The sand gets into bearing surfaces and other places where it is not wanted, and causes trouble.

FORD AND CHEVROLET QUESTIONS

1—What are the correct adjustments of vibrating coils on Fords?

2—Explain ignition timing of Chevrolet 490.

3—Which of the two engines are most powerful, Ford or Chevrolet 490?

The only absolutely correct way to adjust the vibrators of Ford coils is with the testing device especially designed for the operation. A very good way is with the aid of a low reading, alternating current ammeter. Using a Ford magneto as a source of current the vibrator of each coil should be adjusted until, with a good hot spark passing at least $\frac{1}{8}$ -in., the current consumption as shown by the meter is between 2 and 2.5 amp. This method is of no value if batteries are used.

2—With No. 1 piston at the top of the compression stroke and the spark advance lever set in the full retarded position turn the distributor until the breaker points just separate, mesh with the timing gears and secure.

3—The S. A. E. ratings of the two engines are as follows: Ford, 22.5 hp.; Chevrolet, 21.75 hp.

The Accessory Show Case

New Fitments for the Car

Universal Piston Ring

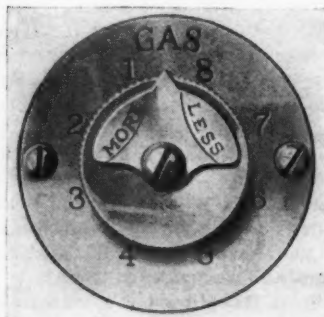
Of interest to repair shops and service stations is the new Universal, one-piece piston ring offered by the Universal Machine Co., of Baltimore, Md. The claims made for this ring are that being eccentric it fills the piston groove snugly and exerts an equal pressure on the cylinder over its full diameter, thus equalizing wear, and that the beveled top edge has the effect of collecting lubricating oil and distributing it in an unbroken film during the down stroke of the piston. A recess in the ring just above its center also retains oil and forms a gas tight seal. Universal rings are supplied in all standard stock and oversizes.

Ford Rear Axle Truss

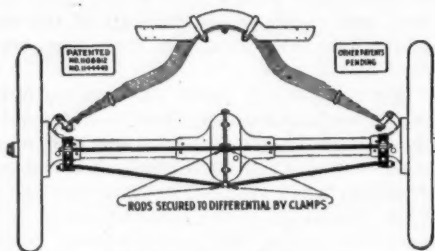
The "Bracerite" Master Truss Rods for Ford rear axles, manufactured by the Master Products Co., 1142 Belmont Ave., Chicago, Ill., are claimed to relieve the differential housing of all lateral strains, thus keeping it in true alignment at all times. The braces are made in both the single and double truss pattern, the former being applied beneath the axle while the latter braces it across both the bottom and back. The devices are marketed through the jobbing trade exclusively.

Unbreakable Hydrometer

What is claimed to be the nearest approach to an unbreakable hydrometer is the instrument produced by The Perfection Hydrometer Co., 742 Turner St., Los Angeles, Cal. The one-eighth inch thick steam glass tube is protected for its full length by three one-fourth inch fibre rods. These are secured, at their ends, in triangular pieces which hold them in alignment. It is claimed that the protection is as nearly complete as it is possible to make it and that the device may be dropped without danger of damage. Should anything, such as a tool, fall upon the instrument the fibre rods are practically certain to fend it off before it can reach the glass.



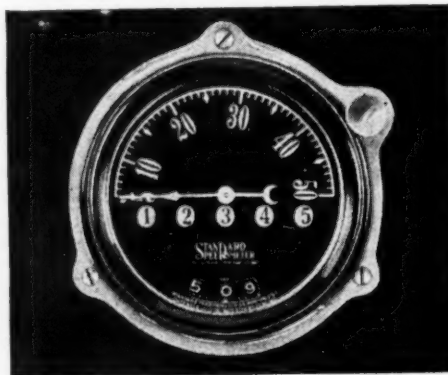
Ford carburetor control



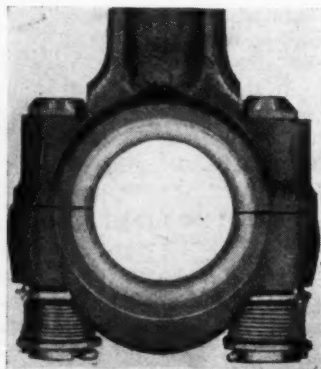
Ford rear axle truss



Universal piston ring



Standard speedometer



Kil-Nock bearing adjuster

Kil-Nock Bearing Adjusters

What is claimed to be a sure cure for knocking connecting rod bearings has been introduced to the trade by the Kil-Nock Co., Davenport, Iowa. The device consists of a pair of specially designed bolts and nuts which take the place of those regularly supplied with the bearing. Interposed between the nut and the connecting rod cap is a blue steel piano wire spring which keeps a constant, even pressure on the cap, automatically compensating for wear as it occurs. In applying Kil-Nock all shims are removed as it is claimed that the semi-flexible effect of the springs renders shims unnecessary.

Standard Speedometer

The Standard Speedometer, manufactured by the Standard Thermometer Co., 65 Shirley St., Boston, Mass., is especially designed for Ford installation. It is claimed to be exceptionally accurate and, being of the non-magnetic type, unaffected by the proximity of electrical appliances. The mileage registering elements consist of a 10,000 mile, repeating season register and a 100 mile trip meter which may be reset to zero in five seconds.

Ford Carburetor Control

Bettering fuel economy and engine efficiency is the object of the Standard Carburetor Control offered by the Standard Thermometer Co., 65 Shirley St., Boston, Mass. The device is designed to be mounted on the instrument panel of all models of Fords and attached to the needle valve adjusting rod by means of a suitable linkage, part of the outfit. The dial of the instrument is divided into graduations, numbered from 1 to 8 and a movable pointer, connected with the extension adjusting rod is marked with the words "More and Less" on the left and right hand sides. It is claimed that the device will encourage adjusting the carburetor to the most efficient running position after the engine has become warmed up as it places the adjustment in a handy accessible location.



Perfection hydrometer

Service Equipment

Time Savers for the Shop

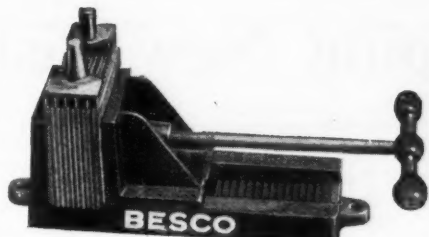
Revolving Brush Washer

The Turbine Auto Washer, manufactured by the Turbine Auto Washer Co., of Three Rivers, Mich., is a miniature turbo-brush contrivance which, driven at a high rate of speed by the stream from a hose, reaches into every crevice of the wheels, springs, etc., and digs dirt and grease loose. On the board of the body panels and hood the device is said to give excellent service as the soft, rapidly moving bristles require the minimum of pressure, do not pick up gritty particles and thus, prevent scratching. After driving the turbine the clean water is thrown out through the brush bristles by centrifugal force.

Handy Battery Station Tools

The Battery Equipment & Supply Co., 1458 Michigan avenue, Chicago, are marketing, among other tools of interest to the battery service man, the Besco separator, trimmer and plate press. The former is of all steel construction, the bed plate being formed of one solid piece of heavy gage metal. The knife is also of exceptionally heavy design making the device suitable for use as a grid trimmer. There being no wood used in the tool it will not absorb moisture and warp.

The battery vise and plate press is also a time saver as it opens to a great enough width to accommodate any of the standard size batteries, holding them firmly and thus facilitating the removal of elements or jars. When shortened up to its smaller dimension it is said to form a practicable plate press for the straightening of warped elements or groups.



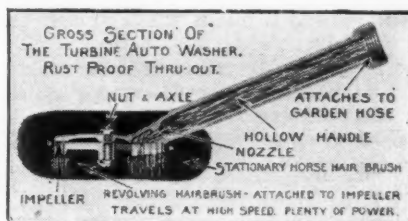
Battery vise and plate press



Besco separator trimmer

Connecting Rod Alignment Jig

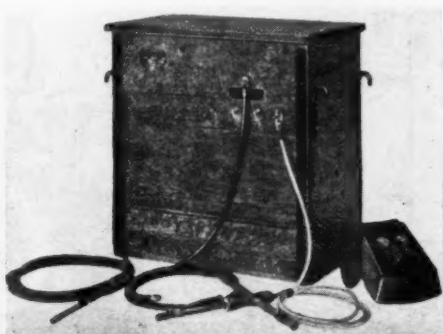
For testing and aligning the connecting rods of Ford cars and Fordson tractors The Railway Specialty Co., of Atchison, Kan., is offering the connecting rod alignment jig illustrated. This tool, of sturdy construction and claimed to be accurate within very narrow limits, is made in two sizes, each especially designed for its particular job. The passenger car connecting rod jig is priced at \$30 while that designed for the heavier parts retails at \$50.



Turbine revolving brush washer



Campbell power door for garages



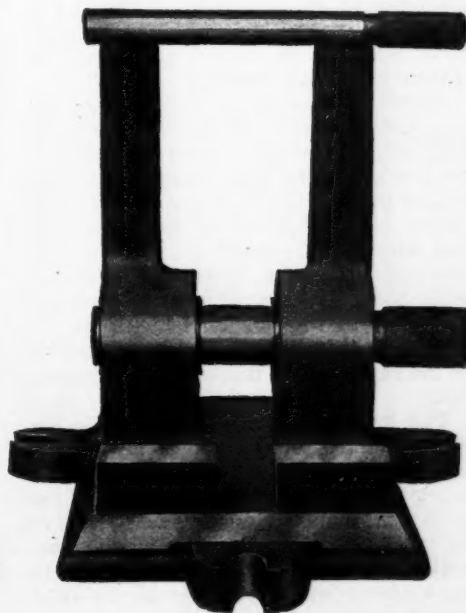
Poly-phase arc welder

Electric Welder

Electric welding of cracked water jackets and like operation is claimed to be efficiently performed by the Allan Poly-Phase Arc Welders manufactured by the Allan Manufacturing and Welding Corporation of Buffalo, N. Y. The type L. C. machine is designed primarily for this class of work while the B. L. C. type has a wider range of utility. It is said that the use of the arc welder eliminates the necessity of pre-heating with the attendant danger of warping and cracking. Being constructed on the transformer principle there are no moving parts in the apparatus and, therefore, there should be no maintenance costs.

Power Door for Garages

Power operated garage doors are coming into exclusive use all over the country. One manufactured by the Campbell Manufacturing Co., Minneapolis, Minn., is claimed to be of very sturdy, durable construction, simple to install and economical to operate. The power element, operating on compressed air, is said to develop ample energy to quickly open or close four part panel doors with a maximum opening of 10 ft. For this type of door an overhead power unit is supplied while for the double hung type, in which the top half lifts vertically and the lower one disappears into a floor recess, the power element is designed for wall suspension.



Connecting rod alignment jig

Automotive Repair Shop

Practical Maintenance Hints

Lapping New Pistons

AN every day query which the repairman has to answer is: "Tell me what does my engine need? It knocks, smokes and hasn't any power."

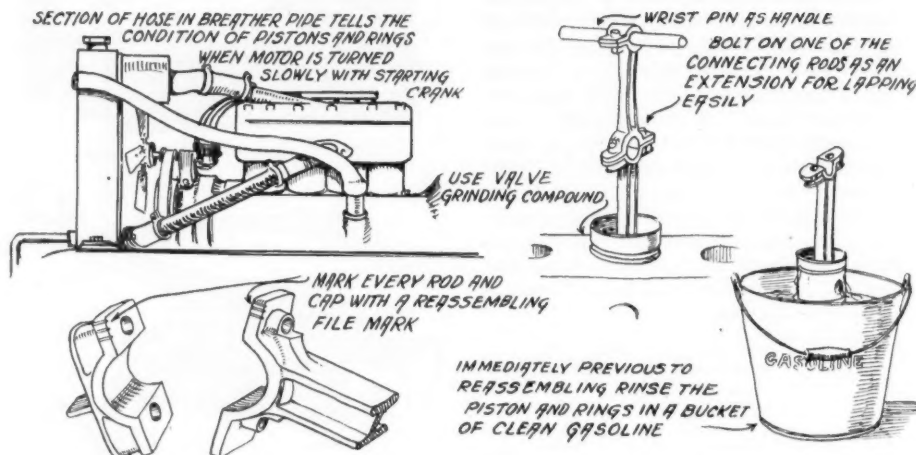
If the car has been driven twenty thousand miles or more it needs oversize pistons and new rings. To keep the oil in the engine base where it belongs and the gas in the cylinders, fitted rings and pistons are essential. It is hardly advisable to tell the owner that he should use heavier oil for the reason that its use will only convince the owner that the repairman needs a further schooling in mechanics, when he finds that the use of heavier oil only adds carbon the faster.

Tell the owner he needs new pistons and demonstrate it with the following simple test. Remove the breather cap and place either a piece of pipe or hose in the opening. Have him, the owner, listen at the end while the motor is turned over with the starting crank. The steady hiss of the escaping gas into the engine base is conclusive proof that the piston and rings have worn beyond effective usefulness in sealing the cylinder.

In the end it is economy for the owner to have new pistons and rings fitted, apart from the more satisfactory running of the engine, as the saving in oil, gas and the removal of carbon are daily or weekly expenditures which total in excess of the initial cost of the parts to be renewed. For the information of the repairer who is inexperienced, a piston .0025 of an inch oversize, is just about right for an engine which has run fifteen to twenty thousand miles.

However, this piston will require fitting and the procedure will be as follows. The old pistons are removed by disconnecting at the crankshaft and lifting them out of the top of the block. Mark each piston at the big end of the connecting rod with a joint mark on the cap with the edge of a file. Mark the first rod with one mark, the second with two and so on in order. For convenience in re-assembling, mark on the side adjacent to the camshaft, as this is easy to remember.

The next step is to file the lap in the rings and a simple test on the joint is to insert a double thickness of newspaper at the joint and enter them in the cylinder. This spacer is about .006 of an inch and close enough for all purposes. The first trial of the piston in the cylinder will show tight at the skirt and it must be brought down to size with good lapping compound. To lap



the piston, bolt on one of the other connecting rods and, using a wrist pin as a handle, with a small quantity of the grinding compound wiped on the piston insert the piston in an inverted position in the cylinder.

About a dozen strokes in which the piston is rotated at the same time as it is moved up and down is about all the lapping required. To test for clearance, the piston should be washed off in a bucket of gasoline, also the inside of the cylinder wiped with gasoline on a clean rag. Without touching piston with the hand lift it out of the gasoline and place it in the cylinder. When the weight of the two connecting rods causes it to descend slowly through the cylinder the piston is just right.

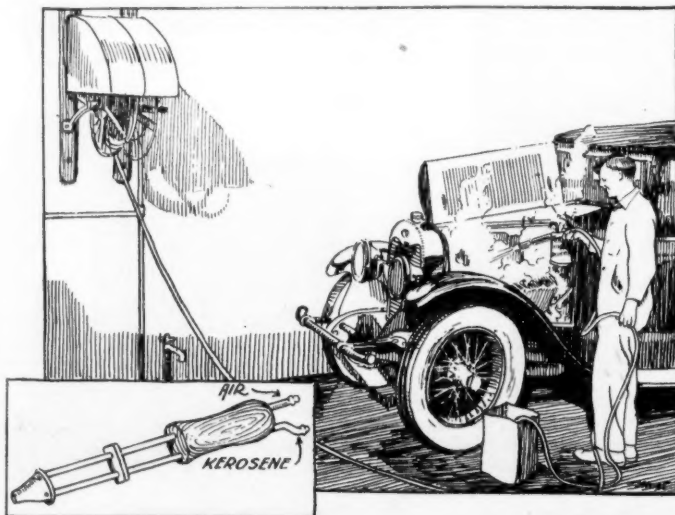
In this fitting the rings are not in place as most repairmen consider it inadvisable and unnecessary to lap the narrow face of a ring. The reassembling de-

tails are familiar to the repairer, but one detail worth noting is that the assembled piston with rings, immediately before placing in the cylinder, should be rinsed off in a clean bucket of gasoline, to free them of grit. With the hands, cylinder and piston free from grit, the snug fitting piston will enter with far less effort and in less time.—G. S. Luers, 1845 Kalorania Rd. N. W., Washington, D. C.

Cleaning Parts by Spraying

All smoke and gasoline fumes are eliminated in the W. M. Murphy Motors Co. service station, San Francisco, by having all spraying and testing done on the roof. A sump is provided on the roof which takes care of the grease when spraying parts. The device for spraying parts consists of a 5-gal. can with a 10-ft. rubber hose which leads from this can to the

spraying device. The can is filled with distillates, and by means of compressed air the distillate is sprayed against the parts to be cleaned. The 10-ft. hose to which the spray is attached is wound up on a reel, a spring and chain always keeping the hose wound up when not in use. Air connections are provided at numerous points along the roof to increase the speed and economy of the work.



Radiators on 1920 Trucks

Motor Age Maintenance Data Sheet No. 154

One of a series of weekly pages of information valuable to service men and dealers—save this page

Name and Model	Cap.	Radiator Make	Radiator Type	Name and Model	Cap.	Radiator Make	Radiator Type
Old Reliable, A.....	1½	Chicago	Tubular	Signal, F.....	1	McCord	Fin
Old Reliable, B.....	2½	Chicago	Tubular	Signal, H.....	1½	McCord	Fin
Old Reliable, C.....	3½	Chicago	Tubular	Signal, J.....	2	McCord	Fin
Old Reliable, D.....	5	Chicago	Tubular	Signal, M.....	3½	McCord	Fin
Old Reliable, K.....	7	Chicago	Tubular	Signal, R.....	5	McCord	Fin
Oldsmobile Economy.....	¾	Own	Cellular	Standard, 1K.....	1	Long	Tubular
Olympic, 2.....	2½	Long	Tubular	Standard, 76.....	2½	Long	Tubular
Oneida, B9.....	1¾	Modine	Cellular	Standard, 66.....	3½	Long	Tubular
Oneida, C9.....	2½	Modine	Cellular	Standard, 86.....	5	Long	Tubular
Oneida, D9.....	3½	Modine	Cellular	Sterling.....	1½	Own	Cellular
Oneida, E9.....	5	Modine	Cellular	Sterling.....	2	Own	Cellular
Orleans.....	1½	Chicago	Tubular	Sterling.....	2½	Own	Cellular
Orleans.....	2½	Chicago	Tubular	Sterling.....	3½	Own	Cellular
Orleans.....	3½	Chicago	Tubular	Sterling.....	5	Own	Cellular
Packard, EC.....	.....	Fedders	Tubular	Sterling Chain.....	5	Own	Cellular
Packard, ED.....	.....	Fedders	Tubular	Sterling.....	7½	Own	Cellular
Packard, EF.....	.....	Fedders	Tubular	Stewart, 11.....	¾	Bush	Plain Tube
Packard, EX.....	.....	Fedders	Tubular	Stewart, 8.....	1	Bush	Plain Tube
Packard, EY.....	.....	Fedders	Tubular	Stewart, 9.....	1½	Bush	Plain Tube
Parker, F30.....	2	Bremer	Tubular	Stewart, 7.....	2	Bush	Plain Tube
Parker, J20.....	3½	Bremer	Tubular	Stewart, 10.....	3½	Bush	Plain Tube
Parker, M20.....	5	Bremer	Tubular	Stoughton, B.....	1½	Own	Fin Tube
Patriot, Revere.....	¾	B & W	Cellular	Stoughton, D.....	2	Own	Fin Tube
Patriot, Lincoln.....	1½	Own	Cellular	Sullivan, E.....	2	Bush	Tubular
Patriot, Washington.....	.....	Own	Cellular	Sullivan, H.....	3½	R-T	Fin Tube
Piedmont, 4-30.....	1½	Standard	Cellular	Superior.....	1	Ideal	Cellular
Pierce Arrow.....	2	Own	Fin Tube	Superior.....	2	Ideal	Cellular
Pierce Arrow.....	3½	Own	Fin Tube	Texas.....	¾	Johnstown	Cellular
Pierce Arrow.....	5	Own	Fin Tube	Tiffin, F15.....	1½	G & O	Tubular
Pittsburger, B.....	2½	Own	Tubular	Tiffin, F25.....	2½	G & O	Tubular
Pony.....	¼	Own	Cellular	Tiffin, F35.....	3½	G & O	Tubular
Power, C.....	3½	G & O	Tubular	Tiffin, F50.....	5	G & O	Tubular
Rainier, R-11.....	¾	Harrison	Cellular	Tiffin, F60.....	6	G & O	Tubular
Rainier, R-9.....	1	Harrison	Cellular	Tower, J.....	1½	Own	Tubular
Rainier, R-6.....	1½	Harrison	Cellular	Tower, H.....	2½	Own	Tubular
Rainier, R-8.....	2	Harrison	Cellular	Tower, C.....	3½	Own	Tubular
Reliance, 10A.....	1½	Bush	Tubular	Traffic, 4-18.....	2	Own	Honeycomb
Reliance, 20B.....	2½	Bush	Tubular	Transport, 20.....	1	.....	Cellular
Reo, F.....	¾	Own	Tubular	Transport, 30.....	1½	.....	Cellular
Republic, M10.....	1	Own	Cellular	Transport, 50.....	2	.....	Cellular
Republic, M11X.....	1½	Own	Cellular	Traylor.....	1¼	G & O	Sq. Tube
Republic, M19.....	2½	Own	Cellular	Traylor.....	2	G & O	Sq. Tube
Republic, M20.....	3½	Own	Tubular	Traylor.....	3	G & O	Sq. Tube
Riker, B.....	3	Own	Tubular	Traylor.....	4	G & O	Sq. Tube
Riker, BB.....	4	Own	Tubular	Triangle, AA.....	¾	Perfex	Tubular
Rock Falls, Hearse.....	.....	S-W	Honeycomb	Triangle, A.....	1½	Perfex	Tubular
Rowe, C.D.W.....	2	Modine	Cellular	Triangle, C.....	2	Perfex	Tubular
Sandow, G.....	1	Own	Tubular	Triangle, B.....	2½	Perfex	Tubular
Sandow, CG.....	1½	Own	Tubular	Ultimate, A.....	2	Own	Fin & Tube
Sandow, J.....	2½	Own	Tubular	Ultimate, AJ.....	2	Own	Fin & Tube
Sandow, M.....	3½	Own	Tubular	Ultimate, B.....	3	Own	Fin & Tube
Sandow, L.....	5	Own	Tubular	Ultimate, BL.....	3	Own	Fin & Tube
Sanford.....	2½	McCord	Fin Tube	Union, F.....	2½	G & O	Fin
Sanford.....	3½	McCord	Fin Tube	Union, H.....	4	G & O	Fin
Sanford.....	5	McCord	Fin Tube	U. S., NW.....	1½	Long	Tubular
Schacht, B.....	1½	Own	.....	U. S., R.....	3	Long	Tubular
Schacht, C.....	2½	Own	.....	U. S., S.....	4	Long	Tubular
Schacht, D.....	3½	Own	.....	U. S., T.....	6	Long	Tubular
Schacht, D.....	5	Own	.....	Velie, 46.....	1½	Long	Fin
Schwartz, B.....	1½	Fedders	Cellular	Velie, 26B.....	3½	R-T	Fin
Schwartz, C.....	2½	Fedders	Cellular	Victor, B.....	2	Modine	Fin
Schwartz, D.....	5	Fedders	Cellular	Vim, 29.....	½	.....	Finned Tube
Selden, 1½A.....	1½	Bush	Fin	Vim, 30.....	½	.....	Finned Tube
Selden, 2½A.....	2½	Long	Fin	Vim, 31.....	1	.....	Finned Tube
Selden, 3½A.....	3½	Long	Fin	Vim, 22.....	2	.....	Finned Tube
Selden, 5A.....	5	Long	Fin	Vim, 23.....	3	.....	Finned Tube
Seneca, M20.....	½	Kuenz	Cellular	W-J, B.....	2½	Bush	Tube
Service, 220.....	1	Long	Tubular	Walter, S.....	5	Bush	Fin
Service, 31.....	1½	Long	Tubular	Ward LaFrance, 2B.....	2½	Own	Finned Tube
Service, 36.....	1½	Long	Tubular	Ward LaFrance, HA.....	3½	Own	Finned Tube
Service, 51.....	2½	Long	Tubular	Ward LaFrance, 5A.....	5	Own	Finned Tube
Service, 71.....	2½	Long	Tubular	Watson, B.....	¾	G & O	Cellular
Service, 101.....	5	Long	Tubular	White, 15.....	¾	.....	Cellular

ABBREVIATIONS.—Can—Candler; ZZt—ZigZag Tube; E & M—English & Mersick; R-T—Rome & Turney; M. R.—Marlin-Rockwell.

Specifications of Current Passenger Car Models

NAME AND MODEL	Engine Make	Cylinders: Bore and Stroke	WB	Tires	2-Pass.	5-Pass.	7-Pass.	Coupe	Sedan	NAME AND MODEL	Engine Make	Cylinders: Bore and Stroke	WB	Tires	2-Pass.	5-Pass.	7-Pass.	Coupe	Sedan			
Ace	Guy	6-3 1/2 x 5	123	32x4	\$2975	\$2975		\$3680	\$3680	Maibohm	B Falls	6-3 1/2 x 4 1/2	116	32x4	\$1575	\$1575	\$1750	\$2395	\$2395			
Ace	H-S.	6-3 1/2 x 5	123	32x4	2975	2975		3680	3680	Marmen	34 Own	6-3 1/2 x 5 1/2	136	32x4 1/2	4185	\$3985	3985	4675	5275			
Ace	L	6-3 1/2 x 5	116	32x4	2260	2260				Maxwell	25 Own	4-3 1/2 x 6	109	30x3 1/2	845	845		1445	1545			
Allen	Series 43	4-3 1/2 x 5	110	32x4	\$1395	1395			2395	McFarlan	1921 Own	6-4 1/2 x 6	140	33x5	6300	\$6300	6300	7500	7500			
Ambassador	R Cont.	6-3 1/2 x 5 1/2	136	33x5	14500	\$4500		6500	6500	Mercer	Series 5 Own	4-3 1/2 x 6 1/2	132	32x4 1/2	4500	\$4500	*4500	5700	6200			
American	C	6-3 1/2 x 5	127	32x4	2395	2395		3495	3495	Merit	Cont.	6-3 1/2 x 4 1/2	119	32x4	2245							
Anderson	Series 40	6-3 1/2 x 4 1/2	120	33x4	2195	1795	1845	2795	2795	Metz	R & RR Dues.	4-4 1/2 x 6	129	32x4 1/2	5500	5500						
Apperson	8-21-S	8-3 1/2 x 5	130	34x4 1/2		13500	3500	4500	4500	Mitchell	M6 Rut.	6-3 1/2 x 5	120	32x4	1995	1995		2795	2895			
Auburn	Anniversary	8-3 1/2 x 5	130	34x4 1/2		14250	4250			Mitchell	F-40 Own	6-3 1/2 x 5	120	33x4	\$1490	1490	\$1790	2590	2690			
	6-39	6-3 1/2 x 4 1/2	120	33x4	1745	1695	1695	2795	2795	Moller	F-42 Own	6-3 1/2 x 5	127	33x4			1995					
Beggs	20T	Cont.	6-3 1/2 x 4 1/2	120	33x4	1885	1885		2785	2885	Monitor	A Own	4-2 1/2 x 4	100	27x3 1/2	2000						
Bell	4-32	H-S.	4-3 1/2 x 5	114	31x4		1495				Monroe	B50-52 Cont.	6-3 1/2 x 5	121	33x4							
Bell	6-50	H-S.	6-3 1/2 x 5	124	32x4		1695				Monroe	S-9 & 10 Own	4-3 1/2 x 4 1/2	115	32x3 1/2	1440	1440					
Biddle	B1	Bada	4-3 1/2 x 5 1/2	121	32x4	3475	3475		3975		Monroe	S-11 & 12 Own	4-3 1/2 x 4 1/2	115	32x4	2285	2185	2685	3185	3185		
Birch Super-Four		H-S.	4-3 1/2 x 5	117	33x4	1345	1345	1395	2295	2295	Moon	6-48	Cont.	6-3 1/2 x 4 1/2	122	32x4	4250	4250				
Birch Light Four		Leit.	6-3 1/2 x 5 1/2	108	30x3 1/2	1195	1195				Murray-Mac Six		Own	6-3 1/2 x 5 1/2	128	34x4 1/2	4250	4250				
Birch Light Six		H-S.	4-3 1/2 x 5	117	33x4	1595	1595				Nash	681-7	Own	6-3 1/2 x 5	121	33x4	1695	1695	1850	2650	2895	
Bour-Davis	215	Cont.	6-3 1/2 x 5 1/2	126	33x4 1/2	\$2585	1745	2585	2495	2495	Nash	682	Own	6-3 1/2 x 5	127	34x4 1/2			1875			
Brewster	91	Own	4-4 x 5 1/2	125	32x4 1/2	17000	7000		10500		Nash Four	41-4	Own	4-3 1/2 x 5	112	32x3 1/2	1395	1395		1985	2185	
Briar	4-34	Own	4-3 1/2 x 5	109	31x4	1285	1285		1885	1885	National Sextet	BB	Own	6-3 1/2 x 5 1/2	130	32x4 1/2	3750	\$3750	3750	4900	4950	
Brook	S-21 A	Own	2-3 1/2 x 3 1/2	90	28x3	395					Nelson	D	Own	4-3 1/2 x 4 1/2	104	32x4		1900				
Buick	1922-44-5-6-7	Own	6-3 1/2 x 4 1/2	118	33x4 1/2	1495	1525		2135	2435	Noma	1C	Cont.	6-3 1/2 x 4 1/2	128	32x4 1/2	3000	3200			4450	
Buick	1922-48-9-50	Own	6-3 1/2 x 4 1/2	124	34x4 1/2			17.35	2125	26.35	Northway		Own	6-3 1/2 x 5 1/2	128	33x5	4000	*4200	6000	5600	5400	
Bush	E.C.A.	Lyc.	4-3 1/2 x 5	116	33x4		1245				Norwalk	430-KS	Lyc.	4-3 1/2 x 5	116	32x3 1/2		1135				
Bush	E.C.	Rut.	4-3 1/2 x 5	116	33x4		1575		2050	2150	Oakland	34-C	Own	6-2 1/2 x 4 1/2	115	32x4	1145	1145		1815	1815	
			125	34x4 1/2	3790	13790			4150		Ogren	6-60	Own	6-3 1/2 x 5 1/2	134	33x5	\$3850	3750	3900	5000	5400	
Cadillac	59	Own	8-3 1/2 x 5 1/2	132	35x5			3940		5190	Oldsmobile	43-A	Own	4-3 1/2 x 5 1/2	115	32x4	1445	1445		2145	2145	
Carroll	C	Roch.	6-3 1/2 x 5	128		3985	3985				Oldsmobile	37A	Own	6-2 1/2 x 4 1/2	112	32x4	1450	1450		2145	2145	
Carroll	D	Roch.	6-3 1/2 x 5	128		3185	3185				Oldsmobile	46	Own	8-2 1/2 x 4 1/2	122	33x4 1/2		\$2100	2100		3300	
Case	V	Cont.	6-3 1/2 x 5 1/2	126	34x4 1/2		\$2650	2650	3400	3750	Oldsmobile	47	Own	8-2 1/2 x 4 1/2	115	32x4		\$1695		2395	2395	
Chalmers	6-30	Own	6-3 1/2 x 4 1/2	117	32x4	1545	1545		1795	2295	Overland	4	Own	4-3 1/2 x 4	100	30x3 1/2	695	695		1000	1275	
Chalmers	6-30	Own	6-3 1/2 x 4 1/2	122	33x4 1/2			1945			Packard	Single-Six	Own	6-3 1/2 x 4 1/2	116	33x4 1/2	2975	2975		4150	4250	
Champion	Tourist	Lyc.	4-3 1/2 x 5	113	32x3 1/2		1250				Packard	Twin-Six	Own	12-3 x 5	136	35x5	6000	*6000	6000	8200	8450	
Champion	Special	H-S.	4-3 1/2 x 5	118	32x4	\$1595	1595				Paige	6-42	Own	6-3 1/2 x 5	119	32x4	1635	1635		2450	2570	
Chandler	Six	Own	6-3 1/2 x 5	123	33x4	1930	\$2010	1930	2970	3030	Paige	6-66	Cont.	6-3 1/2 x 5	131	33x4 1/2	2975		2875	3755	3830	
Chevrolet	490	Own	4-3 1/2 x 4	102	30x3 1/2	635	645		1155	1195	Pan	A	Own	4-3 1/2 x 5	108	33x4		1500				
Chevrolet	FB	Own	4-3 1/2 x 4 1/2	110	33x4	1185	1185		1885	1885	Pan American	E&F-6-55	H-S.	6-3 1/2 x 5	121	33x4	2250	2250				
Cleveland	40	Own	6-3 x 4 1/2	112	32x4	1465	1465		2375	2475	Parenti	1921	Own	8-2 1/2 x 4 1/2	120	32x4		2000			3000	
Climber Four	S	H-S.	4-3 1/2 x 5	117	1550	1550					Peterson	650	Cont.	6-3 1/2 x 4 1/2	120	33x4		1895	1925	2895	2895	
Climber Six	S	H-S.	6-3 1/2 x 5	125 1/2	32x4 1/2	2750	2750		4250	4450	Peerless	56-S-7	Own	8-3 1/2 x 5	125	34x4 1/2		\$2990	2990	3680	3950	
Cole	870	North	8-3 1/2 x 4 1/2	127	33x5	3250	3250		4250		Peters		Own	2-3 1/2 x 3 1/2	90	28x3	385					
Columbia	D-C & CS	Cont.	6-3 1/2 x 4 1/2	115	32x4	1945	1795	1995	2895	2895	Piedmont	4-30	Lyc.	4-3 1/2 x 5	116	32x3 1/2		1395				
Comet	C-53	Cont.	6-3 1/2 x 5 1/2	125	33x4 1/2		2350	2450	3650		Piedmont	6-40	Cont.	6-3 1/2 x 4 1/2	122	32x4		1795				
Commonwealth	44	H-S.	4-3 1/2 x 5	117	32x4		1595		2465		Pierce-Arrow		Own	6-4 x 5 1/2	138	35x5	8000	\$7500	8500	9000	9000	
Crawford	21-6-40	Cont.	6-3 1/2 x 5 1/2	122 1/2	32x4	3000	3000		4500		Pilot	6-50	H-S.	6-3 1/2 x 5	126	32x4 1/2	2285	2285	2335	3600	3600	
Crow-Elkhart	L63-65	Lyc.	4-3 1/2 x 5	117	32x3 1/2	\$1295	1295				Porter	40	Own	4-4 1/2 x 6 1/2	142	35x5	6750	6750	6750	6750	6750	
Crow-Elkhart	S63-65	H-S.	6-3 1/2 x 5	117	33x4	\$1545	1545		2395		Premier	6-D	Own	6-3 1/2 x 5 1/2	126 1/2	33x5	4600	\$4600	4600	5600	6100	
Cunningham	V-4	Own	8-3 1/2 x 5	142	35x5	33x5					Premcar	6-40 A	Falls	6-3 1/2 x 4 1/2	117	32x3 1/2		1295				
Daniels	D-19	Own	8-3 1/2 x 5 1/2	132	34x4 1/2	\$3550	\$3550	5350	6250	6950	Raleigh	A-6-60	H-S.	6-3 1/2 x 5	122	32x4 1/2	2250	2250		3100	3200	
Davis	61-67	Cont.	6-3 1/2 x 4 1/2	120	33x4	\$1995	1895	\$2150	2795	2795	Ranger	A-20	Own	4-3 1/2 x 5	116	32x4						
Dispatch		Own	4-3 1/2 x 5	120	34x4	1290	1350	1350	1525	1575	R & V Knight	R	Own	4-3 1/2 x 5	116	32x4		2150		2850	2950	
Dixie Flyer	H-S-10	H-S.	4-3 1/2 x 5	112	32x4	1445	1445		2295	2345	R & V Knight	J	Own	6-3 1/2 x 4 1/2	127	32x4 1/2	3350	\$3350	3350	4000	4200	
Dodge Brothers		Own	4-3 1/2 x 4 1/2	114	32x3 1/2	935	985		1585	1785	Reo	T-6	Own	6-3 1/2 x 5	120	33x4	1550	1850		2700	2750	
Dorris	6-80	Own	6-4 x 5	132	33x5		\$4785	4785	5800	6690	Revere	C	Dues.	4-3 1/2 x 5	131	32x4 1/2	4550	4650	\$4650		6500	
Dort	17-12	D-Ly	4-3 1/2 x 5	108	31x4	1115	1115		1685	1835	Roamer	6-54-E	Cont.	6-3 1/2 x 5 1/2	138	32x4 1/2						
Dupont	A	Own	4-3 1/2 x 5 1/2	124	32x4 1/2	3400	\$3400			4900	Romer		Cont.	6-3 1/2 x 4 1/2	120	32x4						
											Rock Falls	14000	Cont.	6-3 1/2 x 5	132	35x5						
Elcar	K-1	Lyc.	4-3 1/2 x 5	117	33x4	1300	1300				Rolls-Royce		Own	6-4 1/2 x 4 1/2	143 1/2	33x5	U. S. Chassis	s Prior	11750			
Elcar	7-R	Cont.	6-3 1/2 x 4 1/2	117	33x4	\$1700	1700		2500	2600	Saxon	125	Own	4-3 1/2 x 5	112	32x4		1675		2475	2475	
Elgin	L-1	Falls	6-3 1/2 x 4 1/2	118	33x4	\$1695	1595		2495	2495	Sayers Six	DP	Cont.	6-3 1/2 x 4 1/2	118	33x4	2495	2195			3295	
Essex		Own	4-3 1/2 x 5	108 1/2	32x4	1445	1445		1950	2300	Scripps-Booth	B-39-42	North	6-2 1/2 x 4 1/2	115	32x4	1295			1950	2100	
											Seneca	L & O	Leit.	4-3 1/2 x 4 1/2	108	30x3 1/2	1045	1045				
Fergus	S-5-21	Own	6-3 1/2 x 5	126	32x4 1/2		Chassis s Price	10000			Servier	Six	Cont.	6-3 1/2 x 5 1/2	122	33x4	1485	1485		2700	2250	
Ferris		Cont.	6-3 1/2 x 5 1/2	130	32x4 1/2	3350			625	760	Servier	Six	Cont.	6-3 1/2 x 5 1/2	122	33x5	2550	2550	2550	3250	3350	
Ford	T	Own	4-3 1/2 x 4	100	30x3 1/2	370	415				Sheridan	4	North	4-3 1/2 x 5 1/2	116							

Specifications of Current Motor Truck Models

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive	NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive	NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive
				Front	Rear						Front	Rear						Front	Rear	
Acason, R	1	\$2260	3 1/2 x 5 1/4	36x3 1/2	36x5	W	Corbitt, E	1	\$2400	3 1/2 x 5	34x3 1/2	34x4	W	Gary, K	3 1/2	\$4050	4 1/2 x 6	36x5	40x5 1/2	W
Acason, RB	1 1/2	2485	3 1/2 x 5 1/4	36x3 1/2	36x6	W	Corbitt, D	1 1/2	2800	3 1/2 x 5	36x3 1/2	36x5	W	Gary, M	5	5150	5 x 6 1/2	36x6	40x6 1/2	W
Acason, H	2 1/2	3205	4 1/2 x 5 1/4	36x4	36x4 1/2	W	Corbitt, C	2 1/2	3500	4 1/2 x 5 1/4	36x3 1/2	36x7	W	Gersix M	1 1/2	3100	4 x 5 1/2	36x3 1/2	36x7	W
Acason, L	3 1/2	4295	4 1/2 x 5 1/4	36x5	36x5 1/2	W	Corbitt, B	3 1/2	3650	4 1/2 x 5 1/4	36x4	36x7	W	Gersix K	2 1/2	3500	4 1/2 x 5 1/2	36x4	36x8	W
Acason, M	5	5250	5 x 6 1/4	36x6	40x12	W	Corbitt, A	5	4500	4 1/2 x 5 1/4	36x5	36x10	W	Gersix	3 1/2	4500	4 1/2 x 5 1/2	36x5	40x12	W
Ace, C	1 1/2	2295	3 1/2 x 5 1/4	34x3 1/2	34x5	W	Corbitt, AA	5	5500	4 1/2 x 6	36x6	40x6d	W	Giant, 15-A	1 1/2	2425	3 1/2 x 5	34x3 1/2	34x5	W
Ace, A	2 1/2	2795	4 1/2 x 5 1/4	36x4	36x7	W	Cyclone	1 1/2	2800	3 1/2 x 5	34x5 1/2	36x6 1/2	W	Globe D-20	2	3250	4 1/2 x 5 1/2	36x4	36x7	W
Acme, G	1	1995	3 1/2 x 5	35x5 1/2	35x5 1/2	W	Dart, S	1 1/2	2200	3 1/2 x 5 1/2	34x3 1/2	34x6	W	Globe D-20	3 1/2	4150	4 1/2 x 5 1/2	36x5	36x5 1/2	W
Acme, B	1 1/2	2485	3 1/2 x 5 1/4	36x3 1/2	36x6	W	Dart, M	1 1/2	2225	3 1/2 x 5	34x3 1/2	34x4	W	Golden West, G	3 1/2	4500	4 1/2 x 5 1/2	36x6	36x6	W
Acme, F	2	3205	4 1/2 x 5 1/4	36x4	36x4 1/2	W	Dart, W	2	3500	4 1/2 x 5 1/4	36x3 1/2	36x7	W	Golden West, H	4	5090	5 1/2 x 6 1/2	36x6	36x6	W
Acme, A	3 1/2	4295	4 1/2 x 5 1/4	36x5	36x5 1/2	W	Day-Elder, A	1 1/2	2425	3 1/2 x 5 1/4	34x3 1/2	34x5	W	Golden West, GH	3	5000	4 1/2 x 6	36x7	36x7	W
Acme, E	5	5250	5 x 6 1/4	36x6	40x12	W	Day-Elder, B	2	2900	4 1/2 x 5 1/4	36x4	36x7	W	Golden West, T	4	5500	4 1/2 x 6	36x6	36x6	W
Akr'n Multi-Trk 20	1	1995	4 x 5 1/4	34x5	34x5	B	Day-Elder, C	2 1/2	3125	4 1/2 x 5	36x4	36x7	W	Golden West, K	7	6000	5 1/2 x 6	36x6	36x6	W
All-Power, C	1 1/2	2485	3 1/2 x 5 1/4	36x3 1/2	36x6	W	Day-Elder, D	3 1/2	3950	4 1/2 x 5 1/2	36x5	36x5d	W	Golden West, HA	7	6000	4 1/2 x 6	36x6	36x10	W
All-American, B-1	1 1/2	2195	3 1/2 x 5	32x4	32x4	I	Day-Elder, E	5	4875	4 1/2 x 6	36x5	36x6d	W	Gove, A1	2 1/2	2495	4 1/2 x 5 1/2	36x4	36x7	W
American, 25	4 1/2	4575	4 1/2 x 5 1/4	36x5	36x5 1/2	W	Dearborn, F	2	2180	3 1/2 x 5 1/2	34x4	34x5	W	Graham Bros. A	1 1/2	1495 1/2	3 1/2 x 5	33x5 1/2	33x5 1/2	I
American, 40	8 1/2	6000	5 x 6 1/4	36x6	40x12	W	Dearborn, 48	2	2590	3 1/2 x 5 1/2	35x5 1/2	34x7 1/2	W	Gramm-Bern, 10	1 1/2	2050	3 1/2 x 5	36x3 1/2	36x5 1/2	I
Apex, G	1	1675	3 1/2 x 5	33x5 1/2	33x5 1/2	W	Defiance, D	1 1/2	1975	3 1/2 x 5	35x5 1/2	35x5 1/2	I	Gramm-Bern, 65	1 1/2	2725	3 1/2 x 5	36x3 1/2	36x5	W
Apex, D	1 1/2	1915	3 1/2 x 5	34x3 1/2	34x4	I	Defiance, E	2	2550	3 1/2 x 5	35x5 1/2	36x6 1/2	I	Gramm-Bern, 20	2	3175	4 1/2 x 5 1/2	36x4	36x7	W
Apex, E	2 1/2	2605	4 1/2 x 5 1/4	36x4	36x7	I	DeKalb, E2 1/2	2 1/2	2250	4 1/2 x 5 1/4	36x4 1/2	36x6	W	Gramm-Bern, 25	2 1/2	3575	4 1/2 x 5 1/2	36x4	36x4d	W
Apex, F	3 1/2	3975	4 1/2 x 5 1/4	36x5	36x10	I	DeMartini 1 1/2	1 1/2	2600	3 1/2 x 5	36x4 1/2	36x6	W	Gramm-Bern, 35	3 1/2	4375	4 1/2 x 5 1/2	36x5	40x5d	W
Armleder, HW	1 1/2	2485	3 1/2 x 5 1/4	36x3 1/2	36x6	W	DeMartini 2 1/2	2 1/2	3300	4 x 5 1/2	36x3 1/2	36x7	W	Gramm-Bern, 50	5	5275	4 1/2 x 6	36x6	40x6d	W
Armleder, KW	2 1/2	3205	4 1/2 x 5 1/4	36x4	36x4 1/2	W	DeMartini 3	3	4200	4 1/2 x 5 1/2	36x4	36x10	W	G.W.W.	1 1/2	2100	3 1/2 x 5 1/2	35x5	35x5	I
Armleder, 20	3 1/2	4295	4 1/2 x 5 1/4	36x5	36x5 1/2	W	DeMartini 4	4	4850	4 1/2 x 6	36x5	36x12	W	G & J**	2	3850	4 1/2 x 4	36x4	36x7	W
Atco, B	1	1675	3 1/2 x 5	33x5 1/2	33x5 1/2	W	Denby, 12	1	2200	3 1/2 x 5	35x5	36x6	I	G & J**	3 1/2	5175	4 1/2 x 5 1/2	36x5	36x5d	W
Atco, B1	1 1/2	1915	3 1/2 x 5	34x3 1/2	34x4	W	Denby, 33	1 1/2	2300	3 1/2 x 5	35x5 1/2	38x7 1/2	I	Hahn, J1	1	3100	3 1/2 x 5	34x5	34x5	W
Atco, A	2 1/2	2605	4 1/2 x 5 1/4	36x4	36x7	W	Denby, 134	2	2800	3 1/2 x 5	36x3 1/2	36x6	I	Hahn, CD	1 1/2	3250	4 1/2 x 5 1/2	36x3 1/2	36x6	W
Atlas, M.D.	3 1/2	4295	4 1/2 x 5 1/4	36x5	36x5 1/2	W	Denby, 25	3	3600	4 1/2 x 5 1/2	36x4	36x7	I	Hahn, EE	2 1/2	4100	4 1/2 x 5 1/2	36x4	36x8	W
Atterbury, 20R	1 1/2	2775	3 1/2 x 5	34x3 1/2	34x5	W	Denby, 27	4	4600	4 1/2 x 5 1/2	36x5	36x5d	I	Hahn, F	3 1/2	4500	4 1/2 x 6	36x6	40x12	W
Atterbury, 7CX	2 1/2	3205	4 1/2 x 5 1/4	36x4	36x4 1/2	W	Dependable, A	5 1/2	5350	4 1/2 x 5 1/2	36x6	40x6d	W	Hal Fur, E	1	2350	4 x 5	35x5 1/2	35x5 1/2	W
Atterbury, 7D	3 1/2	4295	4 1/2 x 5 1/4	36x5	36x5 1/2	W	Dependable, C	1 1/2	1650	3 1/2 x 5	34x5	36x6	W	Hal Fur, B	2 1/2	3250	4 1/2 x 5 1/2	35x5	38x7	W
Atterbury, 8E	5	5250	5 x 6 1/4	36x6	40x12	W	Dependable, D	2 1/2	2650	4 x 5 1/2	34x5	36x6	W	Hal Fur, F	3 1/2	4250	4 1/2 x 5 1/2	36x6 1/2	40x10 1/2	W
Autocar, 21UF	1 1/2	2485	3 1/2 x 5 1/4	36x3 1/2	36x6	W	Dependable, E	3 1/2	3350	4 1/2 x 6	36x6	38x7	W	Hall	1 1/2	3100	3 1/2 x 5	34x5 1/2	38x7 1/2	W
Autocar, 21UG	2 1/2	3205	4 1/2 x 5 1/4	36x4	36x4 1/2	W	Dependable, G	5	5250	5 x 6 1/4	36x6	40x12	W	Hall	2 1/2	3275	4 1/2 x 5 1/2	36x4	36x6	W
Autocar, 26V	3 1/2	4295	4 1/2 x 5 1/4	36x5	36x5 1/2	W	Diamond T, O	3 1/2	3350	4 1/2 x 6	36x6	38x7	W	Hall	3 1/2	4100	4 1/2 x 5 1/2	36x5	36x5d	W
Autocar, 26-B	5	5250	5 x 6 1/4	36x6	40x12	W	Diamond T, FS	1	2500	3 1/2 x 5 1/2	36x3 1/2	36x5	W	Hall	5	5100	4 1/2 x 5 1/2	36x5	40x6d	W
Available, H1	1 1/2	2485	3 1/2 x 5 1/4	36x3 1/2	36x6	W	Diamond T, T	1 1/2	2960	3 1/2 x 5 1/2	36x3 1/2	36x5	W	Hall	7	5100	4 1/2 x 5 1/2	36x5	40x6d	C
Available, H2	2 1/2	3205	4 1/2 x 5 1/4	36x4	36x4 1/2	W	Diamond T, U	2 1/2	3285	4 x 5 1/4	36x4	36x7	W	Harvey, WEA	1 1/2	2550	4 1/2 x 5 1/2	34x3 1/2	34x5	W
Available, H3	3 1/2	4295	4 1/2 x 5 1/4	36x5	36x5 1/2	W	Diamond T, V	3 1/2	4275	4 1/2 x 5 1/2	36x5	36x5d	W	Harvey, WFA	2 1/2	3300	4 1/2 x 5 1/2	36x4	36x7	W
Available, H5	5	5250	5 x 6 1/4	36x6	40x12	W	Diamond T, W	5	5400	4 1/2 x 5 1/2	36x6	40x6d	W	Harvey, WHA	3 1/2	4300	4 1/2 x 6	36x5	36x5d	W
Available, H7	7	6000	5 x 6 1/4	36x6	40x12	W	Diamond T, EL	5	5650	4 1/2 x 6	36x6	40x6d	W	Harvey, WKA	5	5200	4 1/2 x 6	36x6	40x6d	W
Avery	1	1675	3 1/2 x 5	33x5 1/2	33x5 1/2	W	Diamond T, S	5	5650	4 1/2 x 6	36x6	40x6d	W	Hawkeye, K	1 1/2	2365	3 1/2 x 5 1/2	34x3 1/2	34x5	I
Beck, A. Jr.	1 1/2	1800	3 1/2 x 5	34x3 1/2	34x4	W	Diehl, A	1	2200	3 1/2 x 5	34x4 1/2	35x5	I	Hawkeye, M	2	4315	4 1/2 x 5 1/2	36x4	36x6	W
Beck, C	2 1/2	2605	4 1/2 x 5 1/4	36x4	36x4 1/2	W	Diehl, B	1 1/2	2300	3 1/2 x 5	34x4 1/2	35x5	I	Hawkeye, N	3	4945	4 1/2 x 6	36x5	36x10	I
Bell, O	1 1/2	1915	3 1/2 x 5	34x3 1/2	34x4	W	Dispatch, F	1	1350	3 1/2 x 5	34x4 1/2	34x4 1/2	I	Hendrickson, K	5	4800	4 1/2 x 5 1/2	36x4	36x7	W
Bell, E	2 1/2	2605	4 1/2 x 5 1/4	36x4	36x4 1/2	W	Doane	2 1/2	4100 1/2	4 1/2 x 5 1/2	36x5	36x7	C	Hendrickson, N	2 1/2	3150	4 1/2 x 5 1/2	36x4	36x7	W
Belmont, E	3 1/2	4295	4 1/2 x 5 1/4	36x5	36x5 1/2</															

Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES	Final Drive	NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES	Final Drive	NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES	Final Drive
				Front Rear						Front Rear						Front Rear	
Kimball, AC	2 1/2	\$1975	4 1/4 x 6	36x4 36x8	W	Ogden, A1	1 1/2	\$2550	3 1/2 x 5	36x3 1/2 36x5	W	Service, 71	3 1/2	\$4285	4 1/4 x 5 1/2	36x5 36x5d	W
Kimball, AK	3	4500	4 1/2 x 6	36x4 36x10	W	Ogden, E	2 1/2	3250	4 1/2 x 5 1/2	36x4 36x7	W	Service, 76	3 1/2	4485	4 1/2 x 6	36x5 36x5d	W
Kimball, AE	4	5000	4 1/2 x 6	36x5 40x12	W	Old Hickory, W	1	2175	3 1/2 x 5	36x3 1/2 36x4	W	Service, 10	5	5275	4 1/2 x 6	36x6 40x6d	W
Kimball, AF	5	5975	5 x 6	36x6 40x7d	W	Old Reliable, A	1 1/2	2350	4 x 5	34x4 36x6	W	Signal, NF	1	2475	4 1/2 x 5	34x5 36x6	W
Kissel, Express	1	1985 1/2	3 1/2 x 5 1/2	34x5 34x5 1/2	W	Old Reliable, B	2 1/2	3500	4 1/2 x 6	34x4 36x4d	W	Signal, H	1 1/2	2925	4 1/2 x 5 1/2	34x4 36x6	W
Kissel, Utility	1 1/2	2775	3 1/2 x 5 1/2	36x3 1/2 36x5	W	Old Reliable, C	3 1/2	4250	4 1/2 x 6	36x5 36x5d	W	Signal, J	2 1/2	3275	4 1/2 x 5 1/2	34x4 36x8	W
Kissel, Freight	2 1/2	3475	4 1/2 x 5 1/2	36x4 36x7	W	Old Reliable, D	5	5250	4 1/2 x 6	36x6 40x6d	W	Signal, M	3 1/2	4275	4 1/2 x 5 1/2	36x5 40x5d	W
Kissel, H. D.	4	4475	4 1/2 x 5 1/2	36x5 36x5d	W	Old Reliable, KLM	7	6000	4 1/2 x 6 1/2	36x6 40x7d	W	Signal, R	5	5300	4 1/2 x 6	36x6 40x6d	W
Kleiber, AA	1	2600	4 1/2 x 5 1/2	34x3 1/2 34x5	W	Oldsmobile Econ.	1	1500	3 1/2 x 5 1/2	35x5 1/2 35x5 1/2	I	Southern, 10	1	2 90	3 1/2 x 5	34x3 1/2 34x4	W
Kleiber, A	1 1/2	3100	4 1/2 x 5 1/2	36x3 1/2 36x6	W	Olympic, A	2 1/2	3500	4 1/2 x 5 1/2	36x4 36x7	W	Southern, 15	1 1/2	2590	3 1/2 x 5 1/2	36x6 36x7	W
Kleiber, BB	2	4000	4 1/2 x 5 1/2	36x4 36x7	W	Oneida, A-9	1 1/2	2350	4 1/2 x 5 1/2	36x3 1/2 36x5	W	Southern, 20	2	2990	4 1/2 x 5 1/2	36x6 40x8	W
Kleiber, B	2 1/2	4200	4 1/2 x 5 1/2	36x5 36x8	W	Oneida, B-9	1 1/2	2915	4 x 5 1/2	36x4 36x7	W	Standard, 1-K	1-1 1/2	1950	3 1/2 x 5	34x3 1/2 34x5	W
Kleiber, C	3	4900	4 1/2 x 5 1/2	36x5 36x5d	W	Oneida, C-9	3 1/2	3390	4 x 5 1/2	36x4 36x7	W	Standard, 76	2 1/2-3	3100	4 1/2 x 5 1/2	36x4 36x7	W
Kleiber, D	5	5600	5 x 6 1/2	36x6 40x12	W	Oneida, D-9	3 1/2	4345	4 1/2 x 5 1/2	36x5 36x10	W	Standard, 66	3 1/2-4	4000	4 1/2 x 5 1/2	36x5 36x10	W
Koehler, D	11	2285	3 1/2 x 5	34x3 1/2 34x5	W	Oneida, E-9	5	5400	4 1/2 x 5 1/2	36x6 40x12	W	Standard, 5-K	5-6	5250	4 1/2 x 6	36x6 40x12	W
Koehler, M	11 1/2	3365	4 x 5 1/2	36x4 36x7	W	Orleans, A	1 1/2	2750	3 1/2 x 5 1/2	36x3 1/2 36x5	W	Sterling, 1 1/2	1 1/2	3200	4 x 5 1/2	36x3 1/2 36x6	W
Koehler, MCS	12 1/2	3450	4 x 5 1/2	36x4 36x7	W	Orleans, B	2 1/2	3250	4 1/2 x 5 1/2	36x4 36x7	W	Sterling, 2	2	3500	4 x 5 1/2	36x4 36x6	W
Koehler, F	13 1/2	3450	4 x 5 1/2	36x4 36x7	W	Orleans, C	3 1/2	3750	4 1/2 x 5 1/2	36x4 36x8	W	Sterling, 2 1/2	2 1/2	3650	4 1/2 x 5 1/2	36x4 36x7	W
Koehler, MT, Trac	5	3450	4 x 5 1/2	36x4 36x7	W	Orleans, D	5	4250	4 1/2 x 5 1/2	36x6 40x8	W	Sterling, 3 1/2	3 1/2	4650	4 1/2 x 5 1/2	36x5 4 x 5d	W
K-Z, 1	2 1/2	2250	3 1/2 x 5	34x3 1/2 34x5	W	Oshkosh, A	2	3750	3 1/2 x 5	36x6 36x6 1/2	W	Sterling, 5-W	5	5095	5 x 6 1/2	36x6 40x6d	W
K-Z, 1 1/2	2 1/2	2750	3 1/2 x 5	36x4 36x6	W	Oshkosh, AA	2	3850	3 1/2 x 5	36x6 36x6 1/2	W	Sterling, 5-C	5	6000	5 x 6 1/2	36x6 40x6d	C
K-Z, 2 1/2	2 1/2	3250	3 1/2 x 5	36x4 36x8	W	Oshkosh, BB	2 1/2	4300	4 x 5 1/2	38x7 38x7 1/2	W	Sterling, 7 1/2	7 1/2	6500	5 x 6 1/2	36x6 40x7d	C
K-Z, 3 1/2	3 1/2	4250	4 1/2 x 5 1/2	36x5 40x10	W	Oshkosh, BB	2 1/2	4300	4 x 5 1/2	38x7 38x7 1/2	W	Stewart, 11	1 1/2	1350	3 1/2 x 4 1/2	32x4 1/2 32x4 1/2	I
K-Z, 5	5	5200	4 1/2 x 5 1/2	36x6 40x6d	W	Packard, ED	1	2700	4 1/2 x 5 1/2	36x4 36x7	W	Stewart, 12	1	1750	3 1/2 x 4 1/2	32x4 1/2 32x4 1/2	I
L.M.C., 2-20	2 1/2	2540	4 1/2 x 5 1/2	36x4 40x4d	I	Packard, ED	1	4450	4 1/2 x 5 1/2	36x5 36x5d	W	Stewart, 9	1 1/2	2200	3 1/2 x 5	34x3 1/2 34x5	I
Lange, B	2 1/2	3350	4 1/2 x 5 1/2	36x4 36x6	W	Packard, ED	1	5550	5 x 5 1/2	36x6 40x6d 1/2	W	Stewart, 7	2	2800	4 1/2 x 5 1/2	34x4 34x7	I
Larrabee, U	1 1/2	2400	3 1/2 x 5	34x3 1/2 34x5	W	Packard, EX	1	4200	4 1/2 x 5 1/2	36x6 40x8	W	Stewart, 7-X	2 1/2	2950	4 1/2 x 5 1/2	34x4 34x7	I
Larrabee, C	2 1/2	3400	4 1/2 x 5 1/2	36x4 36x7	W	Paige, 52-19	1 1/2	2880	4 x 5 1/2	34x3 1/2 40x8 1/2	W	Stewart, 10	3 1/2	3350	4 1/2 x 5 1/2	36x5 36x5d	I
Larrabee, L	3 1/2	4200	4 1/2 x 5 1/2	36x5 36x5d	W	Paige, 54-20	2 1/2	3400	4 1/2 x 5 1/2	34x4 34x4d	W	Stewart, 10-X	3 1/2	3850	4 1/2 x 5 1/2	36x5 36x5d	I
Larrabee, W	5	5100	4 1/2 x 6	36x6 40x6d	W	Paige, 51-18	2 1/2	4255	4 1/2 x 5 1/2	36x5 36x5d	W	Stoughton, A	1	1995	3 1/2 x 5 1/2	34x4 1/2 35x5 1/2	I
Lion, L	1	2350	3 1/2 x 5 1/2	35x5 1/2 35x5 1/2	W	Parker, F20	2	3500	4 x 6	34x4 36x4d	W	Stoughton, B	1 1/2	2350	3 1/2 x 5 1/2	36x3 1/2 36x5	W
Luedinghaus, C	1 1/2	2100	3 1/2 x 5	35x5 1/2 35x5 1/2	W	Parker, M20	3 1/2	4400	4 x 6	36x5 40x5d	W	Stoughton, D	2	2800	4 x 5 1/2	36x4 36x7	W
Luedinghaus, W	1 1/2	2700	3 1/2 x 5 1/2	34x3 1/2 34x5	W	Parker, M20	5	5500	4 1/2 x 6	36x6 40x6d	W	Stoughton F	3	3600	4 1/2 x 5 1/2	36x5 1 36x5d	W
Luedinghaus, W	2 1/2	3150	4 1/2 x 5 1/2	36x4 36x7	W	Patriot, Reverse	1 1/2	1785	3 1/2 x 5	36x4 36x5	W	Sullivan, E	3 1/2	3350	4 1/2 x 5 1/2	36x5 36x7	W
Macer, L	1 1/2	2925	4 1/2 x 5 1/2	36x4 36x6	W	Patriot, Lincoln	1 1/2	2450	4 x 5 1/2	36x4 36x5 1/2	W	Sullivan, H	1 1/2	4650	4 1/2 x 5	36x5 36x5d	I
Macer, H	1 1/2	3650	4 1/2 x 5 1/2	36x4 36x4d	W	Patriot, Wash'n	2 1/2	3450	4 1/2 x 5 1/2	36x4 36x7	W	Superior, D	1	1800	3 1/2 x 5	34x4 1/2 34x4	I
Macer, M-2	3 1/2	4500	4 1/2 x 6	36x5 36x5d	W	Piedmont, 4-30	1 1/2	1685	1 1/2 x 5	34x4 34x4 1/2	W	Superior, E	2	2750	4 1/2 x 5 1/2	36x4 36x7	I
Macer, G	5	5500	4 1/2 x 6	36x5 40x6d	W	Pierce-Arrow	2	3750	4 x 5 1/2	36x4 36x4d	W	Super Truck, 50	2 1/2	3300	4 x 6	36x4 36x8	W
MacDonald, A	7 1/2	5750	4 1/2 x 6	40x7 40x14	I	Pierce-Arrow	3 1/2	4950	4 1/2 x 5 1/2	36x5 36x5d	W	Super Truck, 70	3 1/2	4300	4 1/2 x 6	36x5 40x5d	W
Mac, AB D.R.	1 1/2	3450	4 x 5	36x4 36x3 1/2	D	Pioneer, 59	1	1650	3 1/2 x 4 1/2	32x4 1/2 32x7 1/2	W	Super Truck, 100	5	5300	4 1/2 x 6	36x5 40x12	W
Mac, AB Chain	1 1/2	3000	4 x 5	36x4 36x3 1/2	D	Pittsburgher, B 21	2 1/2-3	3800	4 1/2 x 5 1/2	36x5 36x7 1/2	W	Super Truck 150	7 1/2	6300	5 x 6	36x6 40x7d	W
Mac, AB Chain	1 1/2	3300	4 x 5	36x4 36x4d	C	Pony	4	2840	2 1/2 x 4	28x3 1/2 28x3 1/2	C	Texas, A38	3 1/2	1095	3 1/2 x 5	33x4 33x4	I
Mac, AB Chain	1 1/2	3750	4 x 5	36x4 36x4d	D	Power, F	1 1/2	3150	3 1/2 x 5 1/2	36x6 36x6	W	Texas, TK39	1 1/2	1550	3 1/2 x 5	36x6 36x7	W
Mac, AC Chain	3 1/2	4950	5 x 6	36x5 40x5d	C	Power, C	1 1/2	3150	3 1/2 x 5 1/2	36x5 40x10	W	Tiffin, GW	1 1/2	2695	4 1/2 x 5 1/2	36x3 1/2 36x5	W
Mac, AC Chain	5	5500	5 x 6	36x6 40x6d	C	Premcar, B-143	1 1/2	2475	3 1/2 x 5	36x6 36x6 1/2	W	Tiffin, MW	2 1/2	3580	4 1/2 x 5 1/2	36x4 26x3 1/2	W
Mac, AC Chain	6 1/2	5750	5 x 6	36x6 40x12	C	Ramier, R-11	1 1/2	2150	3 1/2 x 5	35x5 1/2 35x5 1/2	W	Tiffin, PW	3 1/2	4760	4 1/2 x 5 1/2	36x5 40x6d	W
Mac, AC Chain	7 1/2	6000	5 x 6	36x7 40x7d	C	Rainier, R-15	3 1/2	4500	4 1/2 x 5 1/2	36x5 36x5d	W	Tiffin, F50	5	5850	4 1/2 x 6	36x6 40x6d	W
Mac, AC Chain	7 1/2	3400	4 x 5	36x4 36x4d	C	Rainier, R-19	1 1/2	2350	3 1/2 x 5	34x3 1/2 31x4	W	Tiffin, HD	6	6050	4 1/2 x 6	36x6 40x12	W
Mac, AC Chain	7 1/2	4950	5 x 6	36x5 40x5d	C	Rainier, R-16	1 1/2	2600	3 1/2 x 5	34x3 1/2 34x5	W	Titan, HT	3 1/2	4550	4 1/2 x 6	34x4 1/2 40x5d	I
Mac, AC Chain	10	5500	5 x 6	36x6 40x6d	C	Rainier, R-18	2 1/2	2950	4 1/2 x 5 1/2	34x4 34x6	W	Titan, HD	6	5400	4 1/2 x 6	36x5 40x6d	I
Mac, AC Chain	13	5750	5 x 6	36x6 40x12	C	Rainier, R-20	2 1/2	3600	4 1/2 x 5 1/2	34x4 34x7	W	Titan, TS	2 1/2	3400	4 1/2 x 5 1/2	34x4 1/2 50x4d	I
Mac, AC Chain	15	6000	5 x 6	36x7 40x7d	C	Rainier, R17	5	5250	4 1/2 x 6	36x6 36x6d	W	Tower, J	1 1/2	3000	4 1/2 x 5 1/2	35x5 35x7	W
Mapleleaf, AA**	2	4150	4 x 5 1/2	36x4 36x7	W	Ranger, TK-20-2	2	3925	3 1/2 x 5	36x6 36x6 1/2	B	Tower, H	2 1/2	3475	4 1/2 x 5 1/2	36x4 36x7	W
Mapleleaf, AB**	3	4775	4 1/2 x 5 1/2	36x5 36x5d	W	Reo, F	3 1/2-11	1385	4 1/2 x 4 1/2	34x4 1/2 34x4 1/2	B	Tower, G	3 1/2	4400	4 1/2 x 5 1/2	36x5 36x5d	W
Mapleleaf, CC**	4	5770	4 1/2 x 5 1/2	36x5 36x5d	W	Reliance, 10A	1 1/2	2500	4 x 5 1/2	36x3 1/2 36x5	I	Traffic, C	2	1955	3 1/2 x 5	34x3 1/2 34x4	I
Mapleleaf, DD**	5	6825	4 1/2 x 5 1/2	36x6 40x6d	W	Reliance, 20B	2 1/2	3200	4 1/2 x 5 1/2	36x4 36x4d	I	Transport, 20	1	1850	3 1/2 x 5	34x3 1/2 34x4	I
Master, JW	1 1/2	2690	4 1/2 x 5 1/2	34x3 1/2 34x5	W	Republic, 10	1	1695	3 1/2 x 5	35x5 1/2 35x5 1/2	I	Transport, 30	2 1/2	2250	3 1/2 x 5	36x3 1/2 36x5	I
Master, W	1 1/2	3290	4 1/2 x 5 1/2	34x4 36x7	W	Republic, 10Exp.†	1	2095	3 1/2 x 5	35x5 1/2 35x5 1/2	I	Transport, 50	3 1/2	2785	4 1/2 x 5 1/2	36x4 36x7	I
Master, D	2 1/2	3540	4 1/2 x 5 1/2	34x4 36x7	D	Republic, 11X	1 1/2	2295	3 1/2 x 5	34x3 1/2 34x5	I	Transport, 70	3 1/2	4195	4 1/2 x 5 1/2	36x5 36x10	I
Master, A	2 1/2	4190	4 1/2 x 6	36x5 40x5d	D	Republic, 19	2 1/2	2795	4 1/2 x 5 1/2	36x4 36x7	I	Traylor, B	1 1/2	2500	3 1/2 x 5	34x3 1/2 34x5	W
Master, E	3 1/2	4640	4 1/2 x 6	36x5 40x5d	D	Republic, 20	3 1/2	3845	4 1/2 x 5 1/2	36x5 36x10	W	Traylor, C	2 1/2	3000</			

Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive	NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive	NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive
				Front	Rear						Front	Rear						Front	Rear	
Ward-LaF., 5A	5	\$3590	5 x 6 1/2	36x6	36x6d	W	Wichita, RX	2 1/2	\$3600	4 1/4 x 6	36x4	36x8	W	Wilson, G	3 1/2	\$4300	4 1/4 x 6 1/2	36x5	36x5d	W
Watson, E	1	1865	3 1/2 x 5 1/4	34x4 1/2	34x4 1/2	W	Wichita, O	3 1/2	4000	4 1/4 x 6	36x5	36x5d	W	Wilson, H	5	5275	4 1/4 x 6	36x6	40x6d	W
Watson, N	3 1/2	4250	4 1/4 x 5 1/4	36x5	36x10	W	Wichita, S	5	5000	4 1/4 x 6	36x6	40x6d	W	Winther, 751	3 1/2	1795	3 1/2 x 5	34x4 1/2	35x5 1/2	W
Western, W1 1/2	1 1/2	2550	4 1/4 x 5 1/4	36x3 1/2	36x5	W	Wilcox, AA	1	2100	3 1/2 x 5 1/2	36x4	36x4	W	Winther, 430	1 1/2	2850	3 1/2 x 5	32x4	32x4	W
Western, L1 1/2	1 1/2	2550	4 1/4 x 5 1/4	36x3 1/2	36x5	W	Wilcox, B	1 1/2	2775	4 1/4 x 5	36x4	36x5	W	Winther, 39	1 1/2	2450	3 1/2 x 5	34x3 1/2	34x5	W
Western, W2 1/2	2 1/2	3250	4 1/4 x 5 1/4	36x4	36x7	W	Wilcox, D	2 1/2	3300	4 1/4 x 5	36x4	36x5 1/2	W	Winther, 49	2	3250	4 x 5	34x4	34x4d	W
Western, L2 1/2	2 1/2	3250	4 1/4 x 5 1/4	36x4	36x7	W	Wilcox, E	3	4250	4 1/4 x 6	36x5	36x5d	W	Winther, 450	2 1/2	3690	4 x 5	34x5	36x6	W
Western, W3 1/2	3 1/2	4250	4 1/4 x 5 1/4	36x5	40x5d	W	Wilcox, F	5	5200	4 1/4 x 6 1/2	36x5	40x6d	W	Winther, 70	3 1/2	4200	4 x 6	36x5	36x5d	W
White, 15	3 1/2	2600	3 1/2 x 5 1/4	34x5 1/2	34x5 1/2	B	Wilson, F	1 1/2	2650	3 1/2 x 5	36x3 1/2	36x5	W	Winther, 109	5	5250	4 1/2 x 6	36x6	40x5d	W
White, 20	2	3450	3 1/2 x 5 1/4	34x5 1/2	34x5 1/2	D	Wilson, EA	2 1/2	3300	4 1/4 x 5 1/4	36x4	36x7	W	Winther, 140	7	5900	5 x 6	36x6	40x7d	W
White, 40	3 1/2	4500	4 1/4 x 5 1/4	36x5	40x5d	D								Witt-Will, N	1 1/2	2750	3 1/2 x 5	36x3 1/2	36x5	W
White, 45	5	5000	4 1/4 x 5 1/4	36x6	40x6d	D								Witt-Will, P	2 1/2	3250	4 1/4 x 5 1/4	36x3 1/2	36x7	W
White Hick., E	1	2450	3 1/2 x 5	34x5 1/2	34x5 1/2	W								Wolverine, J	1	2240	3 1/2 x 5	34x3	34x4	W
White Hick., H	1 1/2	2750	3 1/2 x 5	34x5 1/2	34x5 1/2	W								Wolverine, J	1 1/2	2495	3 1/2 x 5	34x3 1/2	34x5	W
White Hick., K	2 1/2	3150	4 1/4 x 5 1/4	36x4	36x5	W								Wolverine, J	2	2750	3 1/2 x 5	34x4	34x7	W
Wichita, K	1	2300	3 1/2 x 5 1/4	36x3 1/2	36x4	W								Wolverine, J	2 1/2	3475	4 1/4 x 5 1/4	36x5	36x10	W
Wichita, L	1 1/2	2600	3 1/2 x 5 1/4	36x3 1/2	36x5	W								Wolverine, L	3 1/2	4150	4 1/4 x 5 1/2	36x5	36x10	W
Wichita, M	2	2800	3 1/2 x 5 1/4	36x3 1/2	36x6	W								Yellow Cab M2	3 1/2	2050	3 1/2 x 5	32x4	32x4	B
Wichita, R	2 1/2	3000	3 1/2 x 5 1/4	36x4	36x7	W								Yellow Cab M4	1 1/2	2350	3 1/2 x 5	34x4 1/2	34x4 1/2	W

*2-cyl. †6-cyl. ‡8-cyl. All others, not marked, are 4-cyl. Trac., Tractor. **Canadian made.

Final Drive: W—Worm, I—Internal Gear, C—Chain, D—Double Reduction, B—Bevel, 4—Four-Wheel, E—External Gear. *Tires—optional.

†Pneumatic Tires. All others solid. ‡—Price includes body. §—Price includes several items of equipment.

Farm Tractor Specifications and Prices

TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders, Bore, Stroke	Fuel	Plow Capacity	TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders, Bore, Stroke	Fuel	Plow Capacity	TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders, Bore, Stroke	Fuel	Plow Capacity			
All-In One	12-25	\$1975	3	Weid.	4-3 1/2 x 5 1/2	GDK	2-3	Gray	18-36	1836	3	Wauk	4-4 1/2 x 6 1/2	Gas.	4	Post	12-20	\$1800	4	Wauk	4-4 1/2 x 5 1/2	GorK	2			
Allis-Chalm. B	6-12	925	2	LeR.	4-3 1/2 x 4 1/2	Gas.	1	Ground Hog	19-31	\$2000	4	Erd.	4-4 x 6	GerK	3	Prairie Dog. L	9-18	650	3	Wauk	4-3 1/2 x 5 1/2	Gas.	2			
Allis-Chal. G.P	6-12	850	2	LeR.	4-3 1/2 x 4 1/2	Gas.	1-2	Gt. Western St	20-30	1950	4	Beav.	4-4 1/2 x 6	K.	4	Prairie Dog. D	15-30	1250	4	Wauk	4-4 1/2 x 6 1/2	Gas.	3			
Allis-Chalm.	12-20	1495	2	Mid. W	4-4 1/2 x 5 1/2	Gas.	2-3	Hart-Parr	20	995	4	Own	2-5 1/2 x 6 1/2	K.D	3	Ranger Cyl.	8-16		4	LeR.	4-3 1/2 x 4 1/2	Gas.	1			
Allis-Chalm.	18-20	2150	4	Own	4-4 1/2 x 6 1/2	GorK	3-4	Hart-Parr	30	1595	4	Own	2-6 1/2 x 7	K.D	3	Reed	15-30	2250	4	Dom	4-4 1/2 x 6	K.	3-4			
Allis-Chalm	10-18	875	4	Own	4-4 1/2 x 6 1/2	GorK	3	Heider	D	9-16	4	Wauk	4-4 1/2 x 5 1/2	G.K	2	Reed	18-36	2400	4	Dom	4-5 x 6	Gas.	4			
Allwork	2-6		4	Own	4-4 1/2 x 6 1/2	GorK	3	Heider	C	12-20	4	Wauk	4-4 1/2 x 6 1/2	G.K	2	Reliable	10-20	985	4	Own	2-6 x 7	Ker.	2			
Am. work	4-12		4	Own	4-5 x 6	GorK	3	Heider	Cult	6-10	4	LeR.	4-3 1/2 x 4 1/2	Gas.	1	Rex	12-25	1600	4	Wauk	4-4 1/2 x 5 1/2	GorK	3			
Andrews Kin. D	18-36	2550	4	Chim.	4-5 x 6 1/2	GorK	4	Huber Light 4	12-25	1355	4	Wauk	4-4 1/2 x 6	GorK	3	Russell	12-24		4	Own	4-4 1/2 x 5 1/2	GorK	2-3			
Appleton	12-20	1500	4	Buda	4-4 1/2 x 5 1/2	G.K	2-3	Huber Super 4	15-30	1855	4	Midw.	4-4 1/2 x 6	Gas.	3	Russell	15-30		4	Own	4-5 x 6 1/2	GorK	3-4			
Aro	3-5	550	4	Own	1-4 1/2 x 5 1/2	Gas.	1	Illinois Super	18-36	2500	4	Clim.	4-5 x 6 1/2	G.K	4	Russell	20-35		4	Own	4-5 1/2 x 7	GorK	4-5			
Aultman-T.	15-30		4	Chim.	4-5 x 6 1/2	G.K	4	Imperial	40-70	5000	4	Own	4-7 1/2 x 9	G.K.D	10	Russell	30-60		4	Own	4-8 x 10	GorK	8-10			
Aultman-T.	22-45		4	Own	4-5 1/2 x 8	G.K	6	Imperial	5-10		2	LeR.	4-3 1/2 x 4 1/2	Gas.	1-2	Samson	10-20	995	4	Nov.	4-4 x 5 1/2	G.K	2			
Aultman-T.	30-60		4	Own	4-7 x 9	G.K.D	8	Indiana	8-16	1000	4	Own	4-4 1/2 x 5 1/2	G.K.D	4	Sandusky	15-35	1750	4	Own	4-5 x 6 1/2	G.K.D	4			
Automat. B-3	12-24	1785	4	Here's	4-4 x 5 1/2	Gas.	2-3	International	15-30	1950	4	Own	4-5 1/2 x 8	G.K.D	4	Shawnee Com	6-12		2	LeR.	4-3 1/2 x 4 1/2	Gas.	10			
Avery, SR. Cult	5-10		3	Own	4-4 x 4	G.K	2	International	15-30	1950	4	Own	4-5 1/2 x 8	G.K.D	4	Shawnee Com	9-18		2	Gray	4-3 1/2 x 5	Gas.	2-3			
Avery Cult-C	5-10		3	Own	4-4 x 4	G.K	2	J-T	20-40	3485	*2		4-4 1/2 x 6	G.K.D	3-4	Shelby	10-20		4	Erd.	4-4 x 6	GorK	3			
Avery	8-16		4	Own	2-5 1/2 x 6	G.K.D	2-3	Klumb	16-32		4	Clim.	4-5 x 6 1/2			Shelby	15-30		4	Beav.	4-4 1/2 x 6	G.K	3			
Avery	12-20		4	Own	4-4 1/2 x 6	G.K.D	2-3	LaCrosse	6-12	900	4	Own	2-4 x 6	G.K	1	Short Turn	20-40	1500	3		4-4 1/2 x 6	G.K	3			
Avery	12-25		4	Own	2-6 1/2 x 7	G.K.D	3-4	LaCrosse	12-24	1250	4	Own	2-6 x 7	GorK	3	Square T	18-35	2075	3	Clim.	4-5 x 6 1/2	G.K	3			
Avery	14-28		4	Own	4-4 1/2 x 7	G.K.D	3-4	LaCrosse	22-45		4	Midw.	4-4 1/2 x 5 1/2	Gas.	3	Steady Pull	12-24	1485	4		4-4 x 5	Gas.	3			
Avery	18-36		4	Own	4-5 1/2 x 6	G.K.D	4-5	LaCrosse	25-50		4	Own	4-4 1/2 x 6	G.K	4	Stinson	18-36	1935	4	Beav.	4-4 1/2 x 6	G.K	4			
Avery	25-50		4	Own	4-6 1/2 x 7	G.H.D	5-6	Lauson	12-25	1495	4	Midw.	4-4 1/2 x 5 1/2	Gas.	3	Stone	20-40		4	Beav.	4-4 1/2 x 6	G.K	4			
Avery	45-65		4	Own	4-7 1/2 x 8	G.K.D	8-10	Lauson	15-25	1685	4	Beav.	4-4 1/2 x 6	GorK	3-4	Tioga	15-27	2625	4	Wise.	4-4 1/2 x 6	Gas.	3-4			
Bates	15-25		4	Own	4-4 1/2 x 6	Ker.	3	Lauson	21	1530	1985	4	Beav.	4-4 1/2 x 6	GorK	3-4	Titan	10-20	1060	4	Own	2-6 1/2 x 8	G.K.D	3		
Bates Mule F	18-25		*2	Midw	4-4 1/2 x 5 1/2	Gas.	3	Leader	21	1530	1985	4	Beav.	4-4 1/2 x 6	GorK	3-4	Top	30-45	3500	4	Wauk	4-4 1/2 x 6	G.K	3-4		
Bates Mule H	15-25		4	Midw	4-4 1/2 x 5 1/2	Gas.	3	Leader	21	1530	1985	4	Beav.	4-4 1/2 x 6	GorK	3-4	Toro Cultivator	6-10		3	LeR.	4-3 1/2 x 4 1/2	Gas.	2		
Bates Mule G	25-35		*2	Midw	4-4 1/2 x 6	Gas.	com.	Leader	21	1530	1985	4	Beav.	4-4 1/2 x 6	GorK	3-4	Townsend	10-20		2	Own	4-6 1/2 x 7	Ker	2-3		
Bian	8-16		*1	Own	4-3 1/2 x 4	G.K	2-3	Leader	21	1530	1985	4	Beav.	4-4 1/2 x 6	GorK	3-4	Townsend	15-30		2	Own	4-7 x 8	Ker	3-4		
Biemann	2-4	340	4	Own	1-3 1/2 x 4 1/2	G.K	1/2	Leonard	21	1530	1985	4	Beav.	4-4 1/2 x 6	GorK	3-4	Townsend	25-50		2	Own	4-7 1/2 x 10	Ker	4-5		
Best	30		*2	Own	4-4 1/2 x 5 1/2	G.K.D	4	Liberty	21	1530	1985	4	Beav.	4-4 1/2 x 6	GorK	3-4	Traction Motor	40-50		4		8-3 1/2 x 5	Gas.	4-5		
Best	60		*2	Own	4-6 1/2 x 8 1/2	G.K.D	8-9	Linn	21	1530	1985	4	Beav.	4-4 1/2 x 6	GorK	3-4	Traylor	6-12	815	4	LeR.	4-3 1/2 x 4 1/2	Gas.	1		
Boring	1921	1850	3	Wauk	4-4 1/2 x 5 1/2	GorK	2	Little Giant	16-22	2200	4	Own	4-4 1/2 x 6	K.	4	Triumph	18-36	2450	2	Erd.	4-4 1/2 x 6	Ker.	4			
Barn-Oil	1921	1650	4	Own	2-6 1/2 x 7	Ker.	3-4	Little Giant	25-35	3300	4	Own	4-5 1/2 x 6	K.	16	Trundar	25-40	4250	*2	Wauk	4-5 x 6 1/2	GorK	4			
Capital	15-30	1000	2	Own	4-4 1/2 x 6	Gas.	33	Lombard	85-150		*2		4-4 1/2 x 6	G.K	6-10	Turner	14-25	1295	4	Buda	4-4 1/2 x 5 1/2	G.K	3			
Case	10-18	1090	4	Own	4-3 1/2 x 5	GorK	2	Magnet	14-28	1875	4	Wauk	4-4 1/2 x 6 1/2	K&G	3	Twin City	12-20		4	Own	4-4 1/2 x 6	G.K	3			
Case	15-27	1680	4	Own	4-4 1/2 x 6	GorK	3	Master Jr	5-10	585	2	LeR.	2-2 1/2 x 4	Gas.	1	Twin City	20-35		4	Own	4-5 1/2 x 6 1/2	G.K	5			
Case	22-40	3100	4	Own	4-5 1/2 x 6 1/2	GorK	4-5	Merry Gar1921	2	230	2	Evin	1-2 1/2 x 4 1/2	Gas.	3	Twin City	40-65		4	Own	4-7 1/2 x 9	G.K	8			
Caterpillar T11	25		*2	Own	4-4 1/2 x 6	Gas.	4	Minne	12-25	1325	4	Own	4-4 1/2 x 7	GorK	3	Uncle Sam C20	12-20	1385	4	Wid	4-4 x 5 1/2	GorK	2-3			
Caterpillar T16	40		*2	Own	4-6 1/2 x 7	Gas.	6	Minne. All-P	17-30		4	Own	4-4 1/2 x 7	GorK	3-4	Uncle Sam B19	20-30	2300	4	Beav.	4-4 1/2 x 6	GorK	3-4			
Centaur	5-2 1/2	495	2	NWay	2-4 1/2 x 4 1/2	GorK	1-9	Minne. Gen.P	17-30		4	Own	4-4 1/2 x 7	GorK	3-4	Uncle Sam D21	20-30	2075	4	Beav.	4-4 1/2 x 6	GorK	3-4			
Chase	12-25		3	Buda	4-4 1/2 x 5 1/2	GorK	2-3	Minne.								Universal	1-4	475	2	Own	1-3 1/2 x 5	G	1			
Chicago	40	2500	4	Own	4-4 1/2 x 6	G.K.D	2-3	Med.Duty	22-44		4	Own	4-6 x 7	GorK	5-6	Utilitor	501	350	4	Own	1-3 1/2 x 4 1/2	G	5-6			
Clecar	12-20	1495	*2	Own	4-4 x 5 1/2	G.K	2-3	Mohawk 1921	8-16	785	4	Light	4-3 1/2 x 4 1/2	GorK	8-9	Velle	12-24	1750	4	Own	4-4 1/2 x 5 1/2	G.K.D	3			
Dakota	15-27	1750	3	Dom.	4-4 1/2 x 6	Gas.	3	Moline Univ D	9-18	1075	2	Own	4-3 1/2 x 5	Gas.	2	Victory	9-18	1350	4	Gray.	4-3 1/2 x 5	Gas.	2			
Dart	B.J.	15-30	4	Buda	4-4 1/2 x 6	Gas.	3-4	Moline Orch	9-18	1075	2	Own	4-3 1/2 x 5	Gas.	2-3	Victory	1921	1570	4	Wauk	4-4 1/2 x 5 1/2	Gas.	3			
Depue	A	20-30	2500	4	Buda	4-4 1/2 x 6	Gas.	4	Motor Macult	1 1/2	225	2	Own	1-2 1/2 x 3 1/2	Gas.	3-4	Vim	15-30	1650	4	Wauk	4-4 1/2 x 5 1/2	G.K	3		
Dill	D	20	2480	4	Cont.	4-4 1/2 x 5 1/2	Gas.	3	Motox	15-30	2250	4	Buda	4-4 1/2 x 6	Gas.	3-4	Wallis	K	15-25	1600	4	Own	4-4 1/2 x 5 1/2	G.K	3	
Doll	R.W.	20	2989	4	Midw.	4-4 1/2 x 6	Gas.	3	NB	1	3-6	425	4	Own	2-3 1/2 x 4	Gas.	3/4	Waterloo	N	12-25		4	Own	2-6 1/2 x 7	G.K	3
Do-it-All	4-6	593		Own	1-4 1/2 x 5	Gas.		NB	2	3-6	425	4	Own	2-2 1/2 x 4	Gas.	3/4	Webofoot	40	25-40	4000						
Eagle	F	12-22	1390	4	Own	2-7 x 8	GorK	3-4	Nichols-Shep.	20-42	3100	4	Own	8	10	GorK	3-6	Webofoot	53	28-53	5250	*2	Wise.	4-5 1/2 x 7	G.D	6
Eagle	F	16-30	1850	4	Own	2-8 x 8	GorK	4-5	Nichols-Shep.	25-50	2460	4	Own	9	12	GorK	4-7	Wellington	B	16-30	2100	4	Chief	4-4 1/2 x 6	Ker.	3-4
E-B	AA	12-20		4	Own	4-4 1/2 x 5	GorK	3	Nichols-Shep.	25-50	2460	4	Own	9	12	GorK	4-7	Wellington F	16-30	2100	4	Chief	4-4 1/2 x 6	Ker.	3-4	
E-B	Q	12-20		4	Own	4-4 1/2 x 5	GorK	3	Nichols-Shep.	25-50	2460	4	Own	9	12	GorK	4-7	Western	1920	16-32	2100	4	Clim.	4-5 1/2 x 6	Gas.	4
E-B		16-32		4	Own	4-5 1/2 x 7	GorK	3	Nichols-Shep.	25-50	2460	4	Own	9	12	GorK	4-7	Westmore		12-25	1650	4	Wauk	4-4 x 5 1/2	G.K	3
Evans		18-30	2000	4	Buda	4-4 1/2 x 6	G.K	3	Nichols-Shep.	25-50	2460	4	Own	9	12	GorK	4-7	Wharton	E	12-20	1800	3	Buda	4-4 1/2 x 5 1/2	Gas.	2
Fageol	D	9-12	1525	4	Lyc.	4-3 1/2 x 5	Gas.	2	Nichols-Shep.	25-50	2460	4	Own	9	12	GorK	4-7	Whitney		9-18	1175	4	Own	2-5 1/2 x 6 1/2	Gas.	2
Farm Horse		18-30	1885	4	Chim.	4-5 x 6 1/2	G.K	3-4	Nichols-Shep.	25-50	2460	4	Own	9	12	GorK	4-7	Wichita	T	15-30	2500	4	Beav.	4-4 1/2 x 6	G.K.D	3-4
Farquhar		15-25		4	Buda	4-4 1/2 x 6	G.K.D	3-4	Nichols-Shep.	25-50	2460	4	Own	9	12	GorK	4-7	Wisconsin	E	16-30		4	Clim.	4-5 x 6 1/2	Ker.	4
Farquhar		18-35		4	Own	4-6 x 8	G.K.D	4-5	Nichols-Shep.	25-50	2460	4	Own	9	12	GorK	4-7	Wisconsin	H	22-40		4	Clim.	4-5 1/2 x 7	Ker.	5
Farquhar		2																								

COMING MOTOR EVENTS

AUTOMOBILE SHOWS

Reno, Nev.	Automobile Show	July 4-9
Indianapolis	Automobile and Accessory Show	Sept. 5-10
Cincinnati	Fall Automobile Show	Oct. 1-8
Chicago	Automotive Equipment Show	Nov. 14 to 18
New York	Automobile Salon	Nov. 27-Dec. 3
Chicago	Automobile Salon	January—1922

TRACTOR DEMONSTRATIONS

Fargo, N. D.		June 28, 29, 30
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RACES

Uniontown Speedway	Speedway Events	June 18
Cincinnati	Speedway Race (Possible)	July 4
Tacoma	Speedway Race	July 4
La Mans	French Grand Prix	July 25
Elgin	Road Race (Possible)	August 3
Pikes Peak	Hill Climb	September 5
Uniontown Speedway	Annual Autumn Classic	September 5
Los Angeles	Speedway Race	November 24

FOREIGN SHOWS

Reykjavik, Iceland	Agricultural Machinery	June, 1921
Buenos Aires, Argentina	Passenger Cars and Equipment	September
Luxemburg	Luxemburg Agricultural Sample Exhibition	September
Paris, France	Paris Motor Show	October 5-16
London	British Motor Show, Society Motor Mfrs. and Traders	Nov. 4-12

CONVENTIONS

Greenville, S. C.	South Carolina Automotive Trade Association	July 20
Mackinac Island, Mich.	Summer Meeting Automotive Equipment Association	July 4-9
Chicago	Twenty-eighth Annual Convention National Implementation & Vehicle Association	Oct. 12-14
Cleveland	National Tire Dealers' Association	November

Business Notes

Detroit Weatherproof Body Corp. at Coruna, Mich. will be sold at public auction June 17 by the Security Trust Co. of this city as receiver.

General Motors Corp. denies reports from London that it had been instrumental in arranging a loan for the Austin Motor Co. through W. P. Bonbright & Co. The London report was that there might be a virtual fusion of the British interests with those of General Motors.

The Howard County Auto Co. is to be started at Kokomo. Frank C. Pennell, a representative of the Ford Automobile Co. at Fort Wayne for the past four years and who has been connected with the sales and service end of the Ford business for a number of years at Lansing, Mich., will be in charge of the new business.

Leader Battery Equipment Co., Inc., of St. Louis, has opened an office, 324 Title Guaranty Bldg. This company was recently incorporated under the laws of Missouri for \$10,000. Chas. A. Gutke is president.

The R. R. R. Co. has been chartered under the state of Delaware with an authorized capital of \$3,000,000 to build automobiles and automobile accessories. The incorporators are residents of Hartford, Conn. The company, it is stated, has designed a four-cylinder car with air cooled engine and with air compression shock absorbers connecting the frame and axles to take the place of springs. The company has also designed a large water cooled engine to use a mixture of gasoline and crude oil.

Fisher Body Corp. declared the quarterly dividend of \$2 a share payable to stockholders May 31. The dividend was due to be paid April 1, but was suspended until common stockholders had acted on an offering of the parent company to take over the minority common of the Ohio company.

The Royal Motors Co. of Chicago has placed order for 300 bodies with the John W. Henney Co. of Freeport, Ill., and production will begin at once.

The M. S. Sullivan Sales Corp., Charleston, S. C., has been chartered with a capital stock of \$20,000. The firm will conduct a general

motor accessory business. M. S. Sullivan is president and treasurer and H. Svendsen, secretary.

The Lockett Motor Co., Gitzgerald, Ga., was destroyed by fire, with a loss of \$40,000. Eighteen automobiles were destroyed.

The Carolinas Nash Motors Co., Charlotte, N. C., distributors of the Nash cars and trucks, has moved into new quarters at the corner of North Tryon and Eighth streets. Their new building is 50 by 150 feet, three stories, brick and concrete construction.



DONT look upon your customers as a bunch of intruders; they are your guests — treat them as such.

FITTING LIGHT WEIGHT ALLOY PISTONS

(Concluded from page 15)

machine designed to do this work. The cylinder bore must be at perfect right angles with the face of the block. It also must be a perfect circle and the same size for its full length to obtain the desired results. The material of which cylinders are made must be given serious consideration in undertaking an operation of this nature. The cylinders must be perfectly round at combustion heat and many times, unless the cylinders are well seasoned, the heat will warp and cause them to go out of round in a manner that will decrease the efficiency of the engine to quite an extent.

In considering the care and painstaking exactness of building a piston we must remember that the material the wooden pattern is made from must be well seasoned and capable of holding its shape as the dimensions of a piston pattern is measured by comparatively small fractions. The analysis of the material from which a piston is made is very essential to determine the coefficient of expansion even after the tensile strength and ability to perform the duties have been determined.

The expansion of a piston, when subjected to extreme heat, is the big problem of our race drivers and is as important a factor in driving a race as the skill of handling the wheel. If a piston has been fitted too close in a cylinder the oil film will be cut down when expansion takes place and the friction causes the piston to seize, often resulting in a costly repair.

Pistons should be fitted as closely as possible to conserve power because, if the hot gases are allowed to burn past the rings or the piston, it is very injurious to the rings and cylinders naturally impairing and shortening the life of the engine.

Upon investigation it is found that a cylinder, after it had stood the test of expansion and contraction and the foundry strains have been eliminated by the continual heating and cooling, the actual use and age is beneficial to the material of which the cylinders are made. With the results as are shown with the piston fitted too tight also with one fitted too loose we readily can see the nature of the demands as to the extreme care required in the machine work and that the dimensions will be measured in fractions smaller than .001 of an inch.

The automobile does not have a system continually at work rebuilding worn parts, consequently the cylinder and pistons, which are the most abused parts, are subjected to the greatest tasks. Road dust is the arch enemy of pistons and cylinders. This is inhaled by the automobile and carried through its throat into the cylinders causing them to wear out of round or taper producing uneven power which is detrimental to all of the units.